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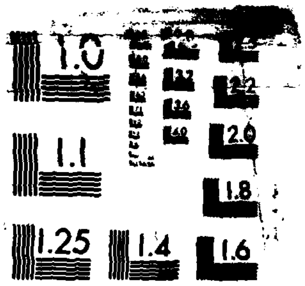
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U.S. NAVY CLIMATIC STUDY OF THE CARIBBEAN SEA AND GULF OF MEXICO VOLUME 4

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GULF OF MEXICO AND GULF OF TEHUANTEPEC

SEPTEMBER 1986

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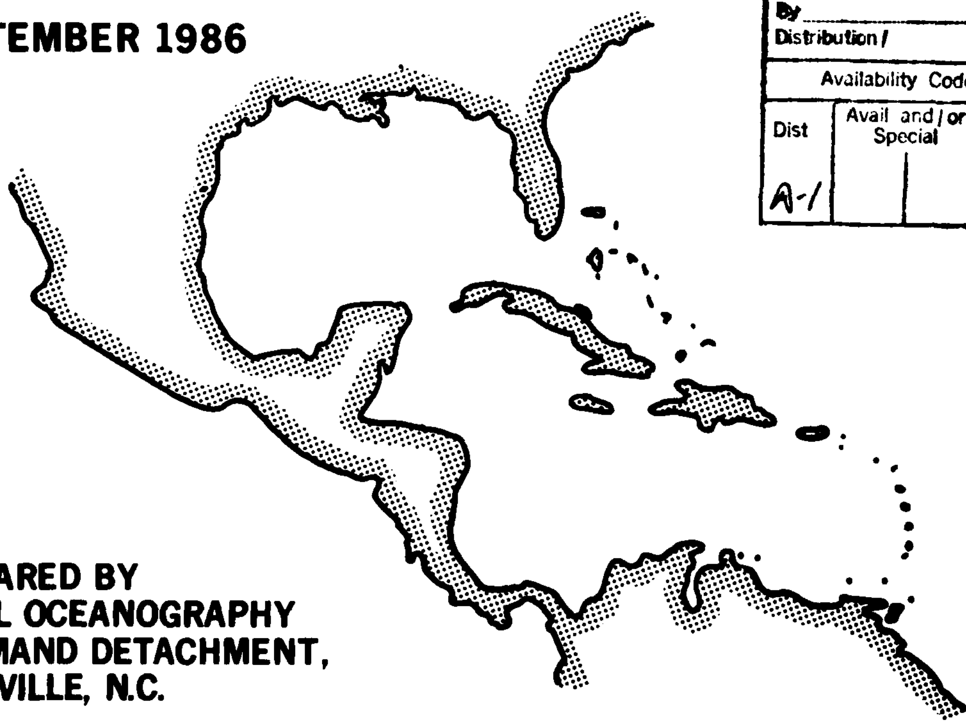

PREPARED BY
NAVAL OCEANOGRAPHY COMMAND DETACHMENT, ASHEVILLE, N.C.

PREPARED UNDER
COMMANDER
NAVAL OCEANOGRAPHY COMMAND
NSTL, MS 39529-5000

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The U.S. Navy Climatic Study of the Caribbean Sea and Gulf of Mexico is made up of four volumes which were prepared under the Commander, Naval Oceanography Command and by the Officer in Charge, Naval Oceanography Command Detachment, Asheville, North Carolina. The work was performed at the National Climatic Data Center (NCDC). Specific acknowledgement of the NCDC staff is made to Mr. J. D. Elms, project leader; Messrs. C. N. Williams Jr. and R. G. Baldwin, and Ms. P. L. Franks for data processing and digital graphics; Mr. M. J. Changery and Dr. W. J. Koss for technical review; Messrs. M. G. Burgin, J. L. Thomas and S. J. Miller, and Ms. C. L. Herman for their drafting skills.

Geographical and Data Coverage

The series of four volumes covers the Central American Waters from the Gulf Coast of North America to the northern coast of South America. The following figure shows the areas covered by each volume, and how they overlap to provide coverage for the entire region.

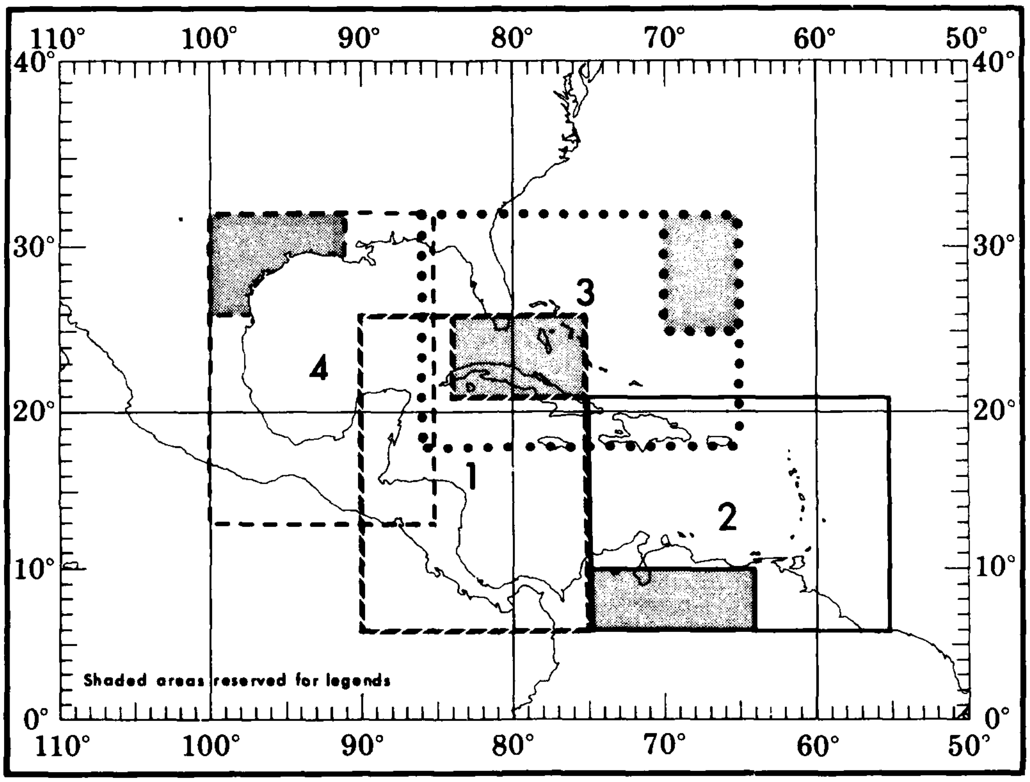


FIG. 1 AREA COVERAGE OF VOLUMES 1—4

This volume, "Gulf of Mexico and Gulf of Tehuantepec," covers Region 4 as outlined on the above map (Fig. 1). It covers the waters from the Gulf Coast of the United States to the Bay of Campeche and from the east coast of Mexico to 85°W (just shy of the west coast continental shelf of Florida). Pacific Ocean waters in and around the Gulf of Tehuantepec are also included.

Greatest effort and detail were given to the charts and analyses of the marine areas. Surface marine statistics are presented on monthly charts in the form of graphs, tables, and isopleth maps. Land station data appear mostly as graphical presentations within the text. A significant problem when trying to define the climate over many of the areas of Central and South America is the lack of data. Political instability and changing economic conditions create periods when little observational data are collected, and for many regions where data does exist it is often fragmented, and neither summarized nor published. For some regions data collected only by the European colonialists are available.

The marine data were machine plotted by one-degree quadrangle and then subjectively analyzed. Graphs and tables of marine-area data (e.g., visibility, wave heights, and wind roses) are also presented by one-degree quadrangle. The graphs and tables represent the objective compilation of available data. Those data were not adjusted for suspected biases (low observation count, heavy weighting of observations taken during a short time interval, biases in coding of observations from various source decks, etc.), hence differences may be found when comparing the graphical data with the isopleth analyses. The total number of observations for a given one-degree square should always be considered when interpreting the data because there may not be a sufficient number to permit climatically representative statistics.

Nearly one million four hundred thousand surface marine observations were used in the computation of the statistics for this volume, and over six million for the total region (4 volume set). Those data, taken from NCDC's Tape Data Family-11 (TDF-11), were collected by ships of various registry from as early as 1854 to 1983, with the bulk of the observations being collected in the last 30 years. This is significant because the more recent observations contain more elements than pre-1948 reports. Observation density is greatest along the major shipping routes. In this study area most ship traffic in the Pacific moves north-south near the Mexican coast while in the Gulf of Mexico most of it moves through the Straits of Florida to and from U. S. Gulf Ports.

Sea-surface current information was extracted from the Naval Oceanographic Office Special Publications 1400-NA9 Surface Currents Southwest North Atlantic Ocean Including the Gulf of Mexico and Caribbean Sea and 1402 - NP13 Surface Currents Southeast North Pacific Ocean Including the West Coast of Central America.

Physical Features

Four major physical-geographical regions are found within the four-volume study area: the mountains (highlands) of Central America and northwest South America, the tropical savanna of eastern Mexico and Pacific Coast of Central America, the humid subtropical lowlands across the southern United States, and the tropical rainforest along the southeastern Atlantic Coast of Central America and on the windward (eastern) side of most of the West Indies Islands.

Low-lying coastal plains cover a rather wide expanse across the southern United States. Elevations remain below 600 feet for some 150 to 200 miles inland before reaching the foothills of the Appalachians in northern Alabama and Georgia, the Ouachita Mountains of Oklahoma and Arkansas, or the Edwards Plateau in Texas. A much narrower coastal plain extends down the east coast of Mexico and it is a relatively short distance inland before the rapidly rising escarpment of the Sierra Madre Oriental Mountains is encountered. Atop this range is a relatively flat plateau extending a major portion of the length of Mexico with mountain peaks reaching 18,000 feet across its southern end. Similar elevation changes and narrow coastal plain occur along the west coast of Mexico where the Sierra Madre Occidental mountain range borders the plateau (reference Topographic Chart, Fig. 2, and geographical locator chart Fig. 3). A rather abrupt break in the mountain range occurs at the southern end of the Bay of Campeche which provides a narrow passage between the Atlantic and Pacific (known as the Istmo de Tehuantepec). Similar breaks occur in southern Nicaragua and across Panama. From the Istmo de Tehuantepec a rather broad coastal plain extends across the Yucatan Peninsula and along the Atlantic Coast of Honduras and Nicaragua. Rugged mountains again rise along the west coast with heights reaching above 13,000 feet in Guatemala and 11,000 feet in Costa Rica.

Two chains of active volcanic ridges extend along major earthquake faults; one chain runs up the Lesser Antilles Island group and the second up the west side of Central America from Colombia to southern Mexico. Scattered throughout the West Indies are numerous islands with the majority falling along the major fault line; this creates the semblance of a stepping-stone pattern from Florida to Venezuela. The larger islands in the group (Cuba, Hispaniola, Jamaica, and Puerto Rico) form the Greater Antilles, and the smaller islands (Virgin Is., Windward Is., Leeward Is., and the islands in the southern Caribbean north of Venezuela) extending south from Puerto Rico to South America, the Lesser Antilles. The Bahama Islands, which lie to the southeast of Florida and north of Cuba, are the third and final major group making up the West Indies.

The highest elevations in the West Indies are found on Hispaniola where peaks reach above 10,000 feet. Peaks as high as 7,000 feet are located on Jamaica with elevations reaching 6,000 feet in southern Cuba. Four-thousand foot peaks occur on Puerto Rico and a few of the smaller islands. Much lower peaks are found on the remaining islands.

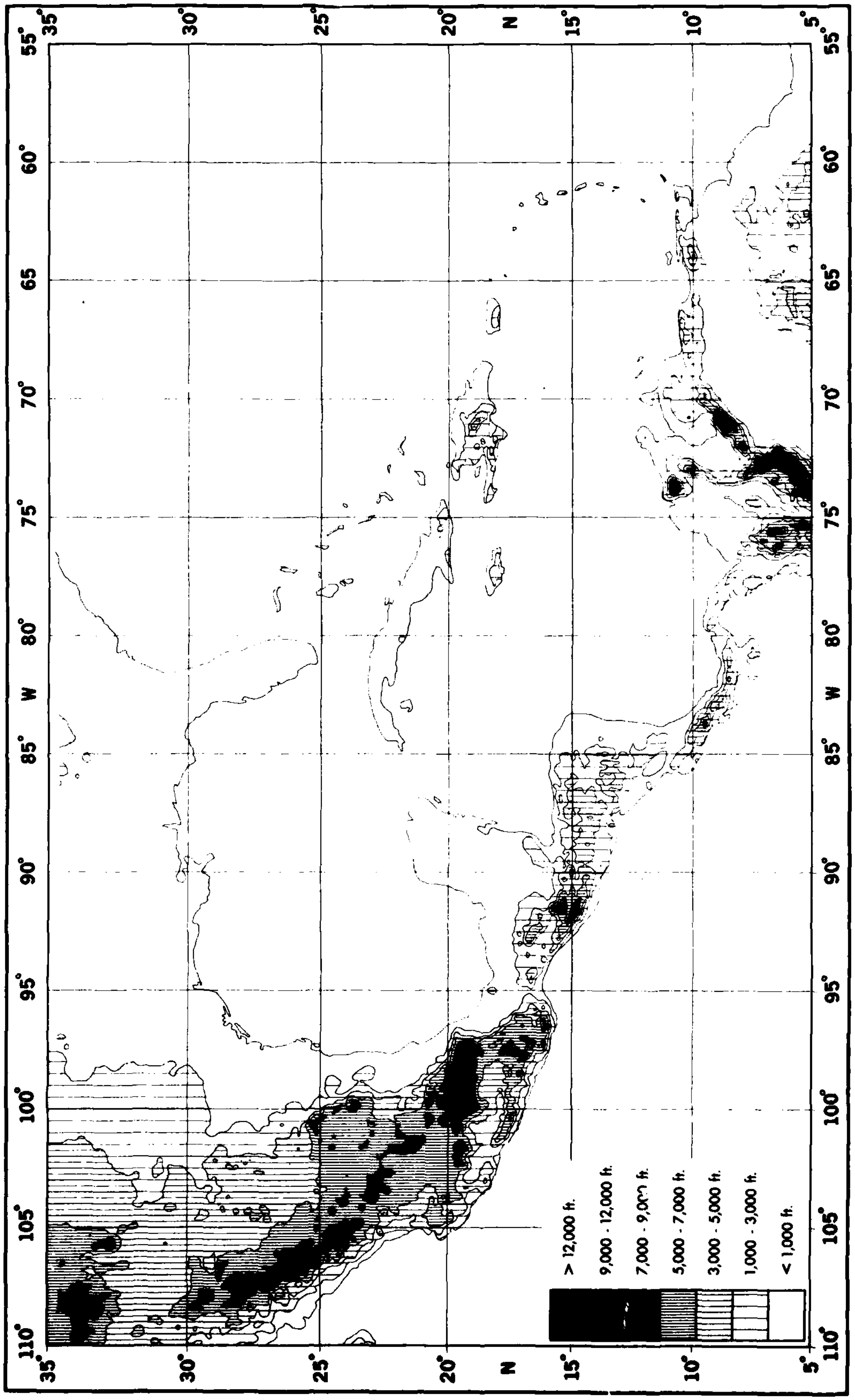


FIG. 2 TOPOGRAPHICAL CHART

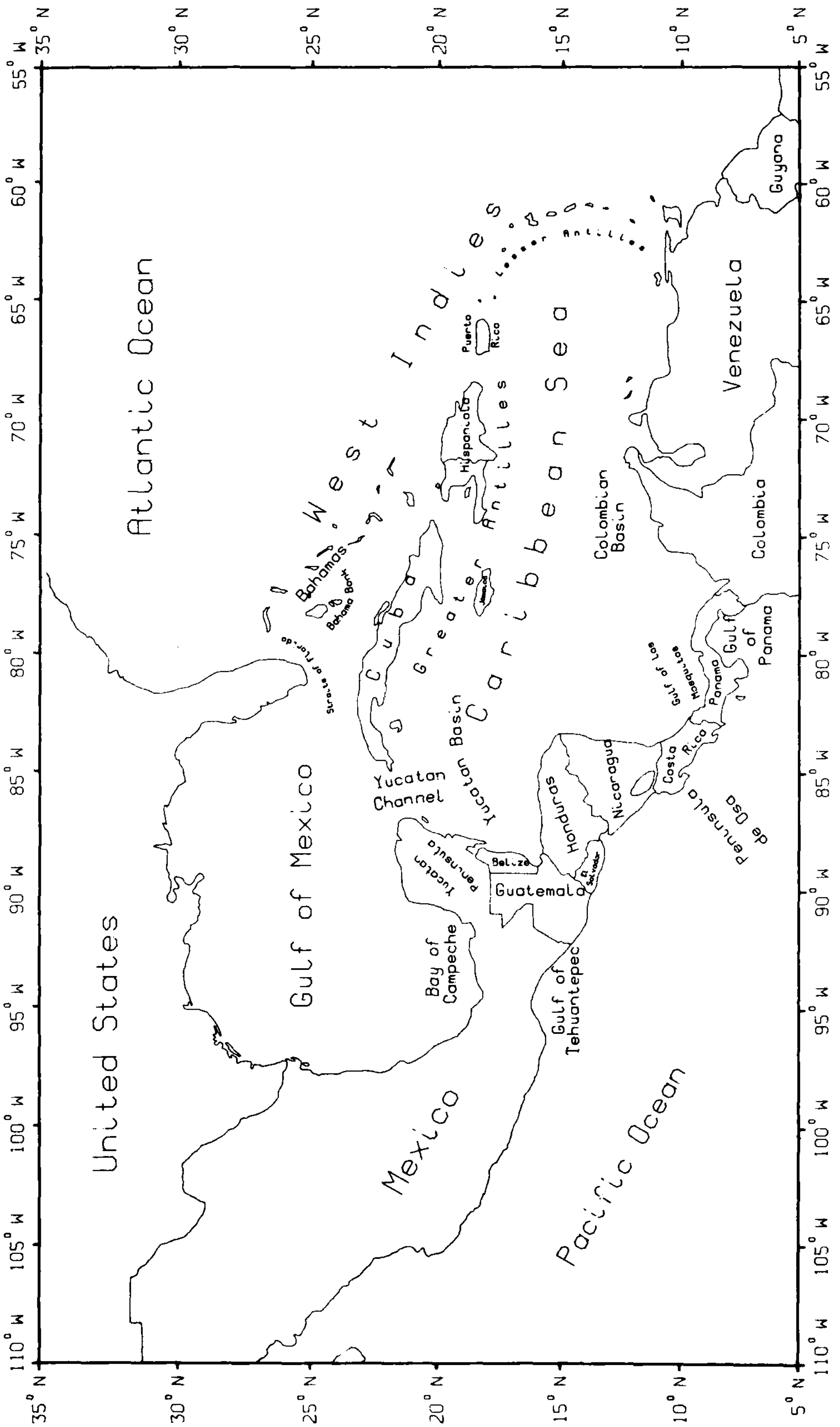


FIG. 3 GEOGRAPHICAL LOCATOR CHART

Figure 4 shows the bathymetry (water depths in fathoms) of the Central American Waters. A broad continental shelf lies along the west coast of Florida extending along the U.S. Gulf Coast narrowing somewhat near the Alabama-Florida state line but then broadening out again until reaching northern Mexico. A rather narrow continental shelf extends down along the east coast of Mexico before widening out significantly along the northwest coast of the Yucatan Peninsula. Another broad shelf area extends from northeast Honduras eastward towards Jamaica. Other broad continental shelf areas include the Bahama Bank, northeast coastal region of South America, and a few smaller areas along the west coast of Cuba. Along the Pacific Coast of Central America a narrow continental shelf runs the full length of the coast except for the Gulf of Panama.

Depths of over 12,000 feet are found in only a few regions of the Gulf of Mexico, but they are rather common in the Caribbean basin. Bathymetry surveys have shown depths of over 20,000 feet in the Cayman Trench south of the Cayman Islands, and over 25,000 feet, the deepest in the Central American Waters, in the Puerto Rico Trench which lies north of the island.

Climate

The northern portions of the Central American Waters lie in the subtropics while southern sections lie within the tropics. This generally means that the Caribbean Sea is under the influence of the easterly trade winds, and the northern part of the Gulf of Mexico the mid-latitude westerlies. Although most parts of the region will feel the effects of both tropical and subtropical conditions, an ill-defined zone exists between the two that is subject to both influences. During the winter, cold air occasionally pushes deep into the Gulf of Mexico with westerly winds often being observed as far south as the southern end of the Mexican Plateau. However, their appearance this far south is often related more to altitude than to latitude. The structure of the trade winds is generally rather shallow with the easterlies normally giving way to the upper westerlies (antitrades) above 3,000 feet.

The general circulation over the entire study area is controlled mostly by the North Atlantic subtropical high, which is commonly known as the Azores or Bermuda high (Fig. 5). Flow along its southern edge produces the large scale northeastern flow known as the trades, the most globally consistent winds for directional constancy. Trade winds are at their weakest during the winter, the dry season, and their strongest during the summer, the wet season. The trades do not generally contain a deep moist layer because of an inversion that usually appears at 3,000 to 5,000 feet above mean sea level. Below this inversion it is quite moist whereas above the inversion it is relatively dry and cloudless. An almost mirror image of the trade wind inversion appears between the northern and southern hemispheres. Equatorward of 15° latitude the inversion rises both westward and equatorward to heights of over 6,000 feet, encircling the equatorial trough. Termination of the trade wind inversion usually takes place in the middle latitudes and variations in the inversion for given locations have proven significant between individual observations (Riehl, 1979). Within the equatorial trough zone and over western portions of the trades the inversion often disappears and it is not considered to be a mean condition. Broad scale subsidence of air within the subtropical high establishes the trade wind inversion. The greatest descent of air takes place across the high's southeastern quadrant which causes the inversion to be generally lower and stronger over the eastern portions of the ocean.

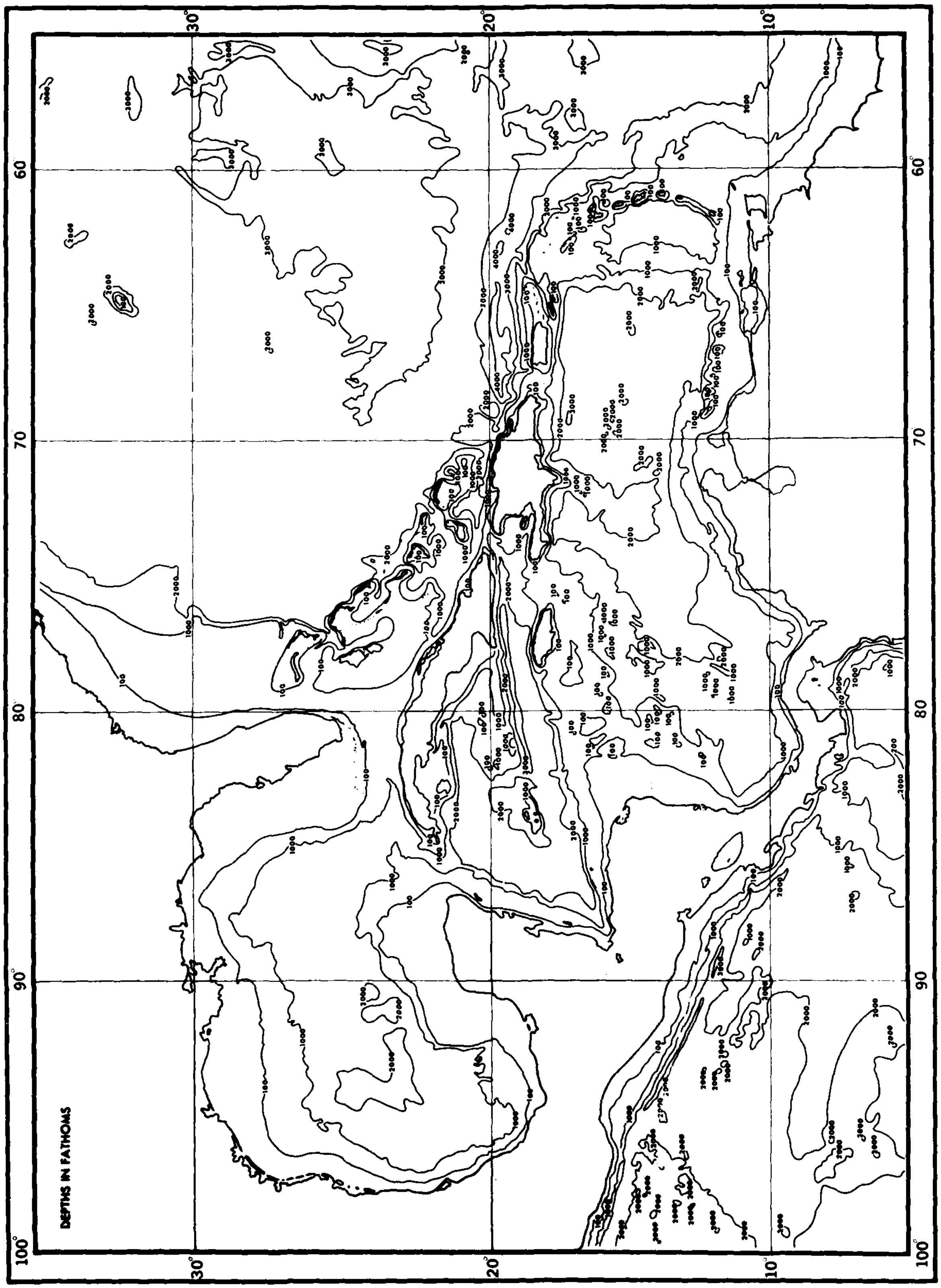
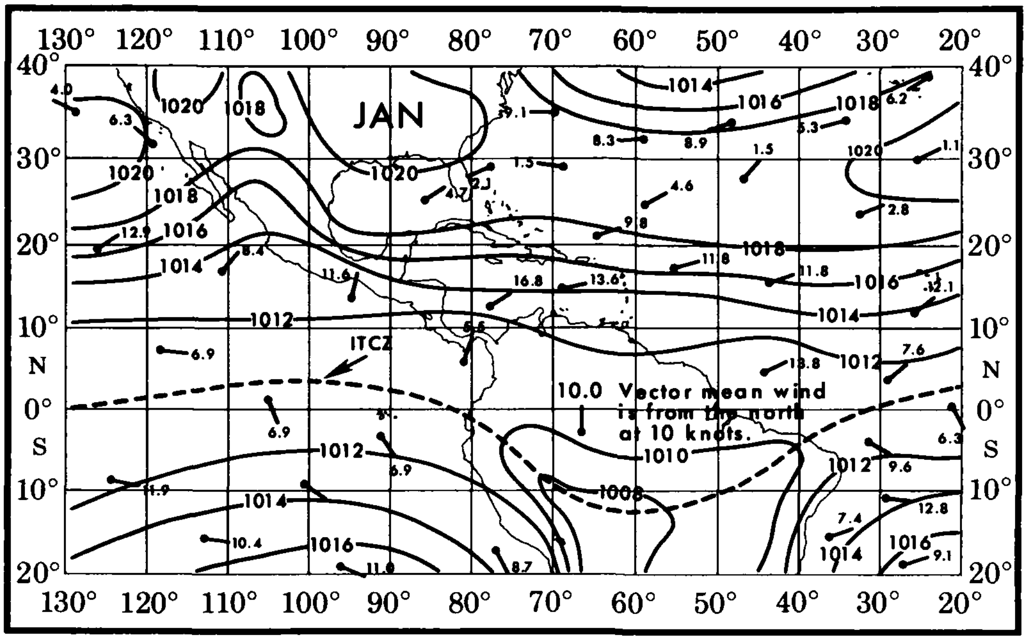


FIG. 4 BATHYMETRY CHART



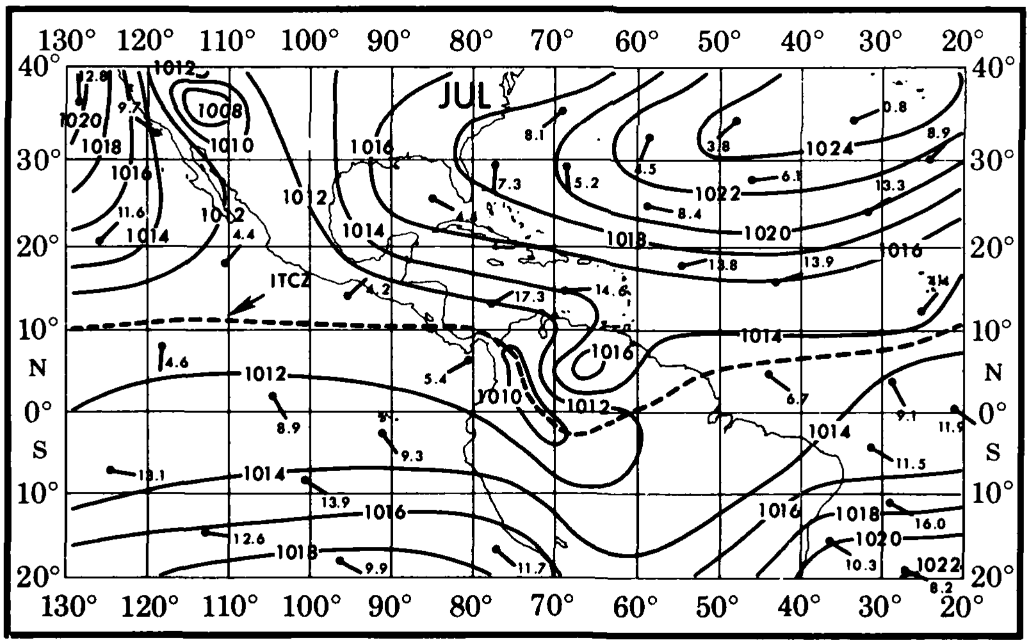


FIG. 5 MEAN EQUATORIAL TROUGH AND VECTOR MEAN WINDS

The Intertropical Convergence Zone (ITCZ), a belt of relatively low pressure lying between the subtropical highs of the northern and southern hemispheres, is another significant climatic feature. This belt is often referred to by many names such as the equatorial trough, trade wind trough, intertropical front, equatorial front, cyclonic directional shear zone, etc. It was originally described as the dividing line between the northeast and southeast trades. Continued research has shown this system to be complex, because it is not necessary for the equatorial trough, the wind convergence zone and maximum cloudiness to coincide. Godshall (1968) showed that a displacement exists between the maximum cloud cover areas and the convergence zone centers and that some of the displacements are quite large. Water vapor transferred from the sea to the atmosphere becomes trapped below the trade inversion and is thus transported to the ITCZ by the trade winds themselves (Augstein, 1976). A good schematic of this process, adapted from Augstein (1976), is shown in Figure 6.

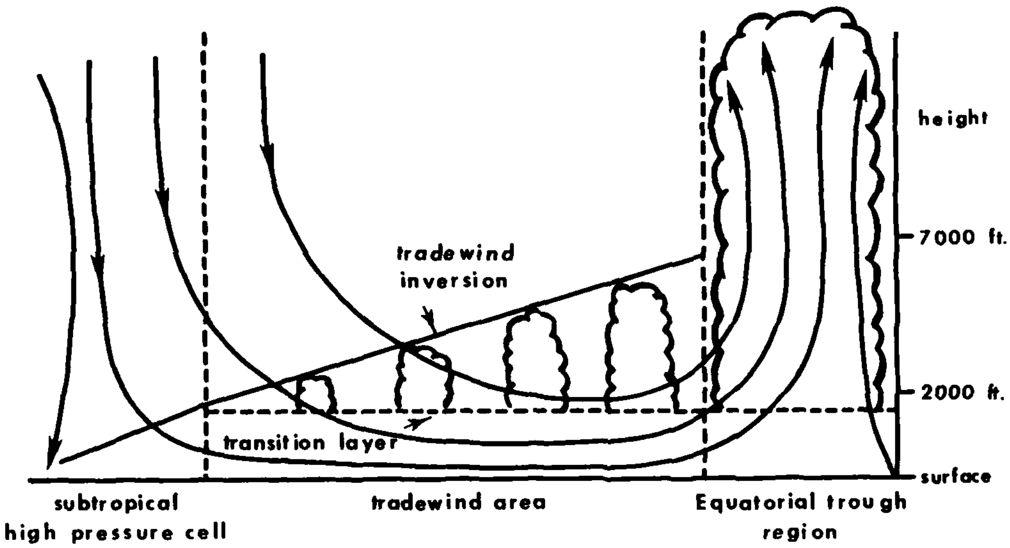


FIG. 6 EQUATORIAL TROUGH/TRADE WIND SCHEMATIC

Movement of the ITCZ, northward and southward, is in harmony with the sun's movement and the resultant strengthening and weakening of the subtropical highs. Studies have shown that the global seasonal progression has its smallest annual displacement between approximately 40°W and 160°W (Riehl, 1979; Balek, 1983) which results in the equatorial trough barely pushing into the Caribbean region even during its most northern extent. During the wet season the equatorial trough tends to lie northwest-southeast across southern Central America (see Fig. 5) affecting the eastern Pacific most significantly.

Continuous change is associated with the ITCZ, from periods with locally heavy downpours to those with clear skies. Large displacements of the zone itself are often observed. Typically there are regions experiencing heavy convective activity while others in close proximity are experiencing no significant weather. An example of such conditions within the ITCZ is seen in Figure 7 (NASA, 1977) where a continuous band of clouds appears over the eastern Pacific while some relatively clear areas appear over the Atlantic.

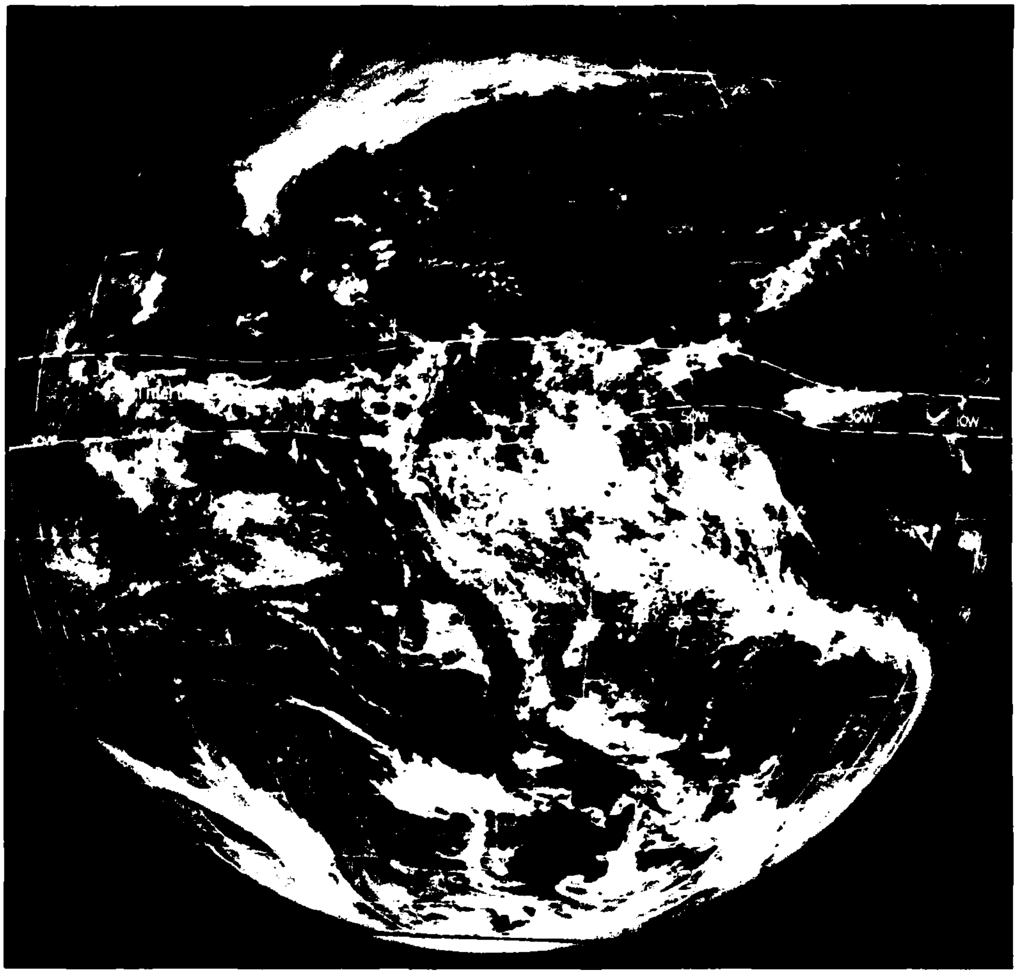


FIG. 7 SATELLITE SYNOPTIC IMAGE (JANUARY 3, 1974, 12:20 GMT)

Two distinct precipitation seasons are typical for most regions of the Central American Waters. An exception is along the Gulf Coast of the United States where four distinct seasons associated with the middle latitudes prevail. Intermonthly precipitation averages differ little throughout the Gulf Coast region. A small maximum is noted in July and a minimum in October. For the large remaining portion of the study area, basically only wet and dry seasons are discernible. The wet season normally runs from May through November with the dry season covering the remaining months. Because the sun's position changes little in the tropics the temperature cycle is typically stable with little annual variation. Expected temperatures are usually of little concern, therefore, the important question is whether the rains will come as expected, for they spell success or failure of the crops. Normal rainfall depends on the major circulation patterns coming into play as the North Atlantic subtropical high builds during the summer season. With its development, easterly winds become stronger aloft transporting increased moisture necessary for the seasonal rains. Orographic effects play an increasingly important role along with convergence and surface heating, as any one of these can trigger the instability necessary for producing rain showers and thunderstorms. As the North Atlantic subtropical high weakens during the winter (see Fig. 5) the westerlies again dominate the flow aloft, cut off the moist easterly flow, and thus bring on the dry season.

Occasionally outbreaks of cold continental air from North America will push into the Gulf of Mexico and Caribbean during the height of the dry season (December through March) bringing precipitation mainly to the coastlines and windward slopes. These cool surges of air are referred to as "northers" and generally bring stronger-than-normal winds and below-normal temperatures as far south as Panama and the southern Caribbean. Northers are modified rather quickly by the tropical environment, thus they affect an area for only one to two days.

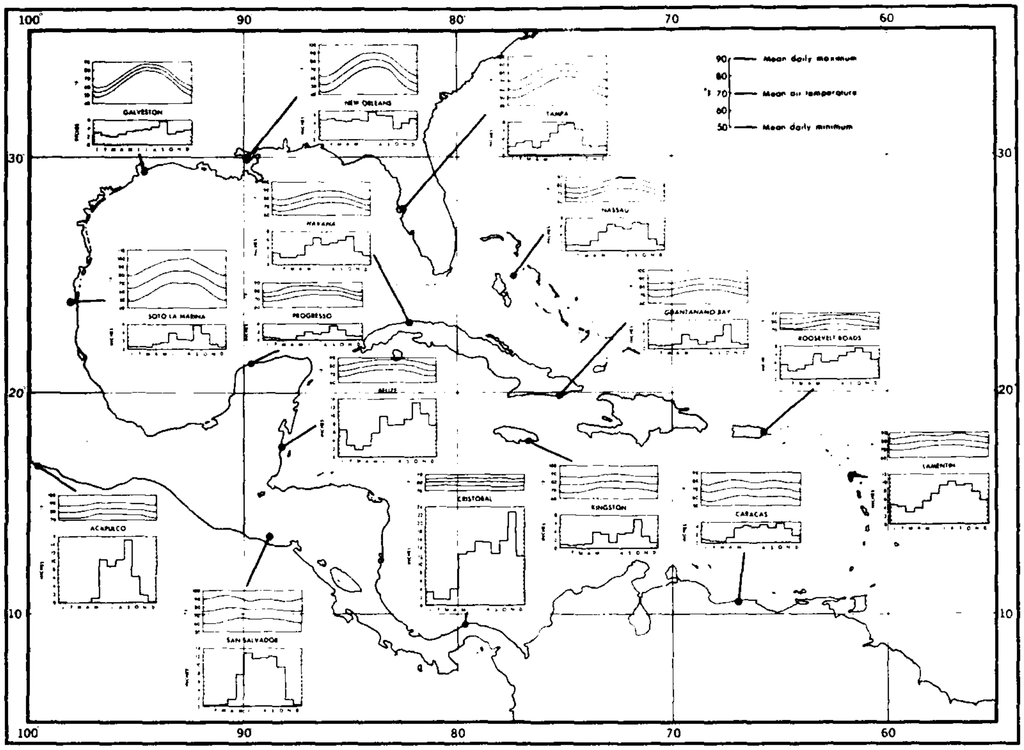


FIG. 8 MONTHLY MEANS OF AIR TEMPERATURE AND RAINFALL

Latitude and maritime influences minimize temperature variations and keep the annual temperature range relatively small. This can be seen in Figure 8 where monthly means of air temperature and rainfall for selected stations are presented. Mean annual temperature ranges are greatest at the higher latitudes, averaging 25°F-30°F along the Gulf Coast of the U.S. and 10°F or less for most regions south of 20°N. Exceptions south of 20°N are found at some of the higher peaks and across most of Mexico north of 16°N and west of 92°W, except for along the Pacific Coast. Diurnal temperature ranges within the tropics are much greater than the monthly mean temperature differences between the warmest and coldest months. Cloudiness is an important factor because it restricts the afternoon maximum temperatures during the rainy season, whereas, the lack of cloud cover during the dry season permits more nighttime cooling resulting in lower minimum temperatures. Northern Mexico and the southern coastal plains of the U.S. experience wintertime mean temperatures of 55°F to 60°F with average summer temperatures increasing to 80°F to 85°F. These summer values are similar in magnitude to those reported in the lower latitudes where seasonal variations are small. The mean freezing level over the Caribbean remains fairly constant throughout the year at 15,000 to 16,000 feet. While freezing level heights remain at these levels over the southern U.S. during the summer, they drop to near 12,000 feet during the winter. Annual variations in the mean tropopause height are also small; the tropopause height ranges from 45,000 to 50,000 feet across the entire study area.

Tropical cyclones are the most feared and devastating weather phenomena of the region. Annual frequencies of these storms vary widely among years. For the period 1871 through 1985, for which there are reasonably good records in the North Atlantic, the least activity occurred in 1890 and 1914 when only one tropical storm was reported. The most active years were 1933, when 21 tropical cyclones reached tropical storm strength (34 knots or greater), and 1969 when 12 reached hurricane strength (64 knots or greater). In the North Atlantic Basin, the main tropical cyclone season runs from August through October with significant occurrences in June, July, and November. April is the only month in which no tropical cyclone has ever been reported within the North Atlantic basin.

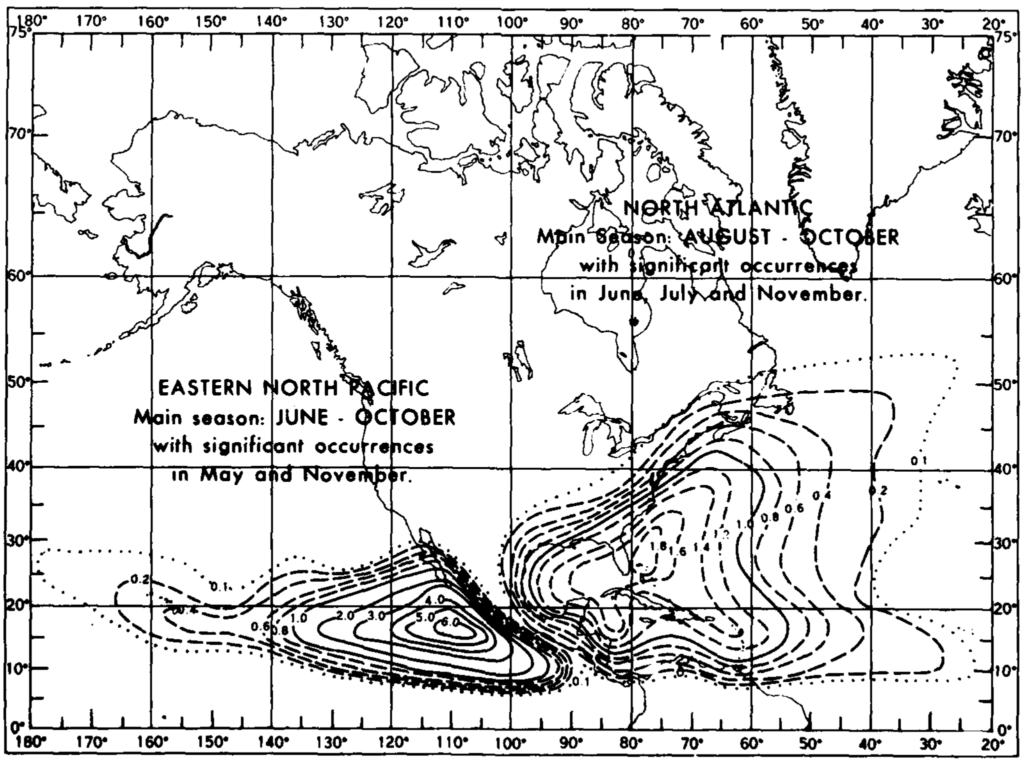


FIG. 9 AVERAGE NUMBER OF TROPICAL CYCLONES PER 5° SQUARE PER YEAR

Highest annual occurrences of tropical cyclones by five-degree square are found in the eastern North Pacific where the main season is from June through October with significant occurrences in May and November. Fortunately most of these storms track west-to-northwestward out to sea with few affecting Central America. The average number of tropical cyclones per five-degree square per year is given in Figure 9 and the annual 12-hourly movements by five-degree square of tropical cyclone centers with tropical storm intensity or greater are shown in Figure 10. Both figures were adapted from Crutcher and Quayle (1974), a major work produced for the U.S. Navy which presents frequencies and preferred tracks for worldwide tropical cyclones.

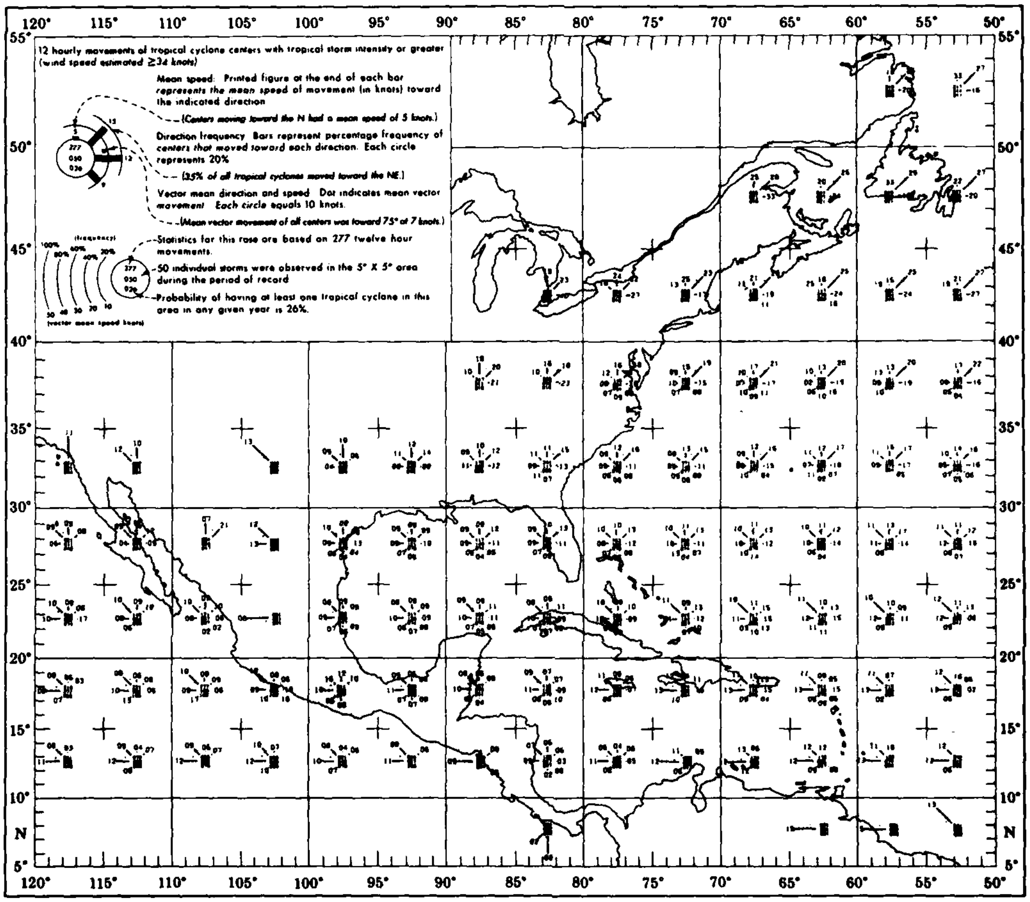


FIG. 10 ANNUAL 12 HOURLY MOVEMENTS OF TROPICAL CYCLONE CENTERS WITH TROPICAL STORM INTENSITY OR GREATER

Precipitation

Of the elements recorded in the marine data base, precipitation is the one most subject to error in both the way it is observed and the way it is interpreted. In many areas of the world, especially in more recent years, it is likely that ships try to avoid foul weather and thus bias the data towards fair weather.

In the Pacific waters of Region 4, a wet and dry season is clearly distinguishable. During the dry season (November through April), the percent of observations reporting precipitation average less than one percent. The remaining months show an increase in percentages in reported cases as the ITCZ moves north and a decrease as it retreats south. On average, September is the rainiest month as frequencies average from 7 to 14 percent.

In the Gulf of Mexico the precipitation patterns are not well defined. Consistently dry weather throughout the year prevails along the Yucatan peninsula where most monthly frequencies average less than 2 to 3 percent. West of the Yucatan peninsula near the Mexican Coast bordering the Bay of Campeche, observations reporting precipitation generally average more than 5 percent except during April and May when frequencies drop below 1 percent. On average this region reports the highest occurrences of precipitation. The U.S. Gulf Coast and Central Gulf observes higher occurrences of precipitation during the winter than the summer even though the differences between season is only on the order of 3 percent.

Assessing oceanic rainfall data is a major problem because transit ships are unable to take quantitative precipitation measurements. A number of studies have been conducted in efforts to predict precipitation amounts or rates of fall based on estimates derived from the use of present weather observations from ships of opportunity (Goroch, et al., 1984) and readings from satellites (Rao, et al., 1976).

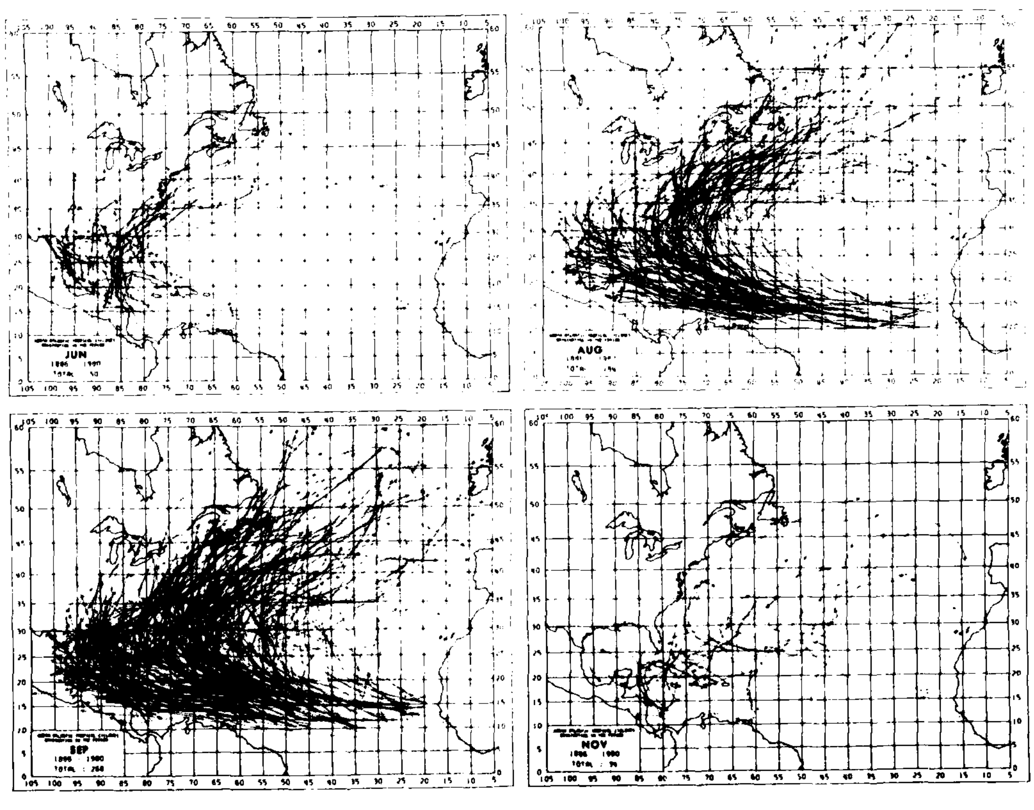


FIG. 11 TROPICAL CYCLONE TRACKS (JUN, AUG, SEP, AND NOV)

Horizontal gradients in rainfall amounts can be notable. As an example, a large differential in mean precipitation was noted within a distance of less than 20 nautical miles, and from an increase in elevation of less than 30 feet, on the Yucatan Peninsula. Progreso, on the coast, averaged 16.69 inches per year (1941-1970 normals) and Merida averaged 37.67 inches for the same period. The differential for the 1961-70 decade was even greater at a ratio of three to one at 13.11 inches versus 38.16 inches. Based on station proximity and similar topography the data would seem to be in error and, in fact, many mean annual precipitation maps do not indicate this differential. Sea surface temperature analyses show cooler sea temperatures along the north coast of the peninsula which tend to inhibit convective activity along the near shore. However, areas slightly inland experience surface heating sufficient to trigger convective showers. In support of this, further investigation showed that while the mean monthly temperatures vary less than 1°F the mean daily maximum temperatures averaged 5°F higher at Merida than Progreso.

Tropical Cyclones

Typically, most Atlantic tropical cyclone development during the early part of the hurricane season (May and June) occurs in the western Atlantic (Caribbean Sea and Gulf of Mexico). Later in the season (July through September) more development occurs in the central and eastern sections, and the season *finale* (October and November) distribution is more evenly divided between the eastern and western halves of the tropical Atlantic. To illustrate how storm development shifts with the season, tropical cyclone tracks for storms originating in June, August, September, and November (1886-1980) are presented in Figure 11.

By referring back to Figure 10, inference can be made on preferred tracks for the region along with the annual probabilities of encountering a storm. From Figure 9 one can see that for Region 4, the chance of encountering a tropical storm is greatest north of the Yucatan Peninsula.

Air Temperature

Air temperature is one of the elements most frequently observed by mariners. On many ships the heating effect of the ship's structure has a tendency to produce higher than actual ambient air temperature readings, because of instrument exposure. This is especially true in the tropics where sunny, calm days are numerous.

From October through May the mean air temperature pattern over the Gulf of Mexico is basically zonal as mean temperatures increase from north to south with the temperature gradient being tightest along the U.S. Gulf Coast. During January, mean temperatures range from the mid-50's to the mid-70's °F. The zonal pattern becomes more meridional along the Gulf Coast of Mexico as the land mass influences the air temperature patterns near shore. Values for this area increase seaward ranging from the upper 60's to the mid-70's°F. From June through August mean air temperatures vary less than 2°F across the Gulf of Mexico, averaging from 82 to 84°F. A slight reversal is noted in the July and August pattern as warmer mean temperatures are found at higher latitudes. September is the transition month where the zonal pattern first begins to establish itself again.

During the winter season the mean air temperature pattern over the Gulf of Tehuantepec reflects the effect of the cooler air spilling across Central America from the Gulf of Mexico. Temperatures are coolest over the Gulf of Tehuantepec, averaging below 76°F in January. Temperatures increase somewhat symmetrically to the east, west, and south. From May through September mean air temperatures generally vary less than one degree Fahrenheit across this region, averaging near 83°F.

Sea Surface-Temperature

Sea-surface temperatures are recorded with a fairly high frequency in marine observations. The principle methods for sampling are intake thermometers and buckets. Even though the two methods can produce slightly different results, the data can be used with considerable confidence.

From October through May the mean sea temperature pattern across the Gulf of Mexico has its tightest gradient along the U.S. Gulf Coast with mean values increasing basically from northwest through southeast ranging from the low 60's to the mid-70's (°F). June's pattern is nearly isothermal with mean sea temperatures varying less than 3°F. July through September's mean pattern is a much weaker reversal from the colder months as the means increase from the southwest to the northeast (ranging in the low to mid-80°F).

The mean sea temperature pattern across the Pacific Ocean portion of Region 4 is very similar to those of the air temperature. The strong winter winds that rush through the Istmo de Tehuantepec from the Atlantic to the Pacific cause cooler sea temperatures in the Gulf of Tehuantepec as compared with those of the surrounding waters. This pattern begins to breakdown in April and doesn't begin to establish itself again until October. During this period the pattern is nearly isothermal with the means near 85°F. The coldest sea temperatures in the Gulf of Tehuantepec average just under 79°F, appearing from December through February.

Surface Winds

Surface wind is one of the most commonly observed elements. Many of the observations from the NCDC data base are visual observations based on the roughness of the sea. In recent years more ships acquired anemometers and reported measured winds. Prior to 1963 many of the wind speeds were recorded in the Beaufort scale; such estimates have proven to be quite reliable and can be used with a high degree of confidence. Five sets of wind speed isopleths are presented: the mean speed, and the percent frequency of winds less than 11 knots, from 11 to 21 knots, from 22 to 33 knots, and greater than or equal to 34 knots. Also included are wind roses, for one-degree squares.

Monthly mean wind speeds clearly undergo a seasonal change in the Gulf of Mexico; they average between 12 and 15 knots during January and February, and drop to between 7 and 10 knots by August.

The Gulf of Tehuantepec is well known by mariners for its strong winds. Close to shore, during the winter, monthly mean winds will run as high as 25 knots in a central core, while within two to three degrees of longitude (in either direction) they will run less than one fourth of the core speed. By summer the core speeds have decreased to 10 knots while those areas that lie within two to three degrees east or west have increased mean speeds by one to two knots.

From May through August gale force winds ($\geq$ 34 knots) average one percent or less of the total winds observed throughout the Gulf of Mexico, and 3 percent or less in the Gulf of Tehuantepec. Throughout the remaining months frequencies remain low across the northern Gulf (2 percent or less). However, beginning in September, gale force winds begin to increase in number (3 percent of the time) in the Gulf of Campeche near Veracruz. Percent frequency continues to increase in this area until reaching a maximum in January of 7 to 9 percent. They then begin to decrease in February, and by April gale force winds are again occurring less than one percent of the time.

Gale force winds are quite prevalent in the Gulf of Tehuantepec from October to April where near shore they average as high as 15 percent or more. Highest frequencies are found in January when they reach as much as 30 percent in a small area near shore.

During winter, wind speeds of less than 11 knots make up 40 to 50 percent of the total wind distribution in the Gulf of Mexico. By summer the central Gulf has increased frequencies of these low wind speeds, to 70 percent. Two regions, however, change little throughout the year with regard to their low wind regime: the Texas coastal region and the western coastal region of the Yucatan peninsula where winds less than 11 knots generally average 40 to 50 percent frequency.

Wind patterns in the Gulf of Tehuantepec look similar no matter what threshold is chosen: tight gradient in winter and weak gradient in summer. Ten knot wind speeds or less are observed less than 30 percent of the time near shore during winter, and more than 60 percent of the time during summer.

Wind speeds of 22 to 33 knots are observed less than 5 percent of the time during August throughout Region 4 except for the near shore area in the Gulf of Tehuantepec, where frequencies just exceed 5 percent. From October through December wind speeds of this magnitude are observed 35 to 40 percent of the time near the coast in the Gulf of Tehuantepec and 5 to 10 percent of the time in the Gulf of Mexico. January brings the highest number of reports (just over 15 percent) of 22 to 33 knot winds to the Gulf of Mexico, where they are confined within a small area just east of Brownsville, Texas.

Visibility

Visibilities are difficult to measure at sea because of the lack of distance reference points. Climatically, many low visibility observations are probably missed because the observer is too busy with other duties (fair weather bias). However, the coarseness of the visibility code intervals tends to minimize the problem thereby permitting the summarized data to be relatively consistent.

Visibility tables, as in previous volumes, are presented by one-degree quadrangle. These tables indicate that visibilities are generally good throughout Region 4, averaging five nautical miles or better at least 90 percent of the time for any month. There are some slight seasonal shifts between the 5 to-less-than 10 nautical mile category and the greater than-or-equal-to 10 nautical mile category. Across the Gulf of Mexico during the winter, the $\geq$10 mile category averages 70 to 80 percent while the 5 to 10 mile category average 15 to 20 percent of the reported visibilities. On average, summer brings a shift of near five percent from the 5 to 10 mile category to the one $\geq$10 mile category. A reversal pattern is seen in the Pacific waters of Region 4, where visibilities are slightly better during the winter. Here, a shift of some 5 percent is seen from the $\geq$10 mile category to the lower category of 5 to 10 miles during the summer.

Clouds

A survey of the cloud data (total and low cloud amounts) from the marine data base shows a number of total cloud reports significantly greater than low cloud amounts. This is because many of the early marine observations contain only total cloud amounts. For the two presentations (total cloud amount $\leq$ 2/8 and low cloud amounts $\geq$ 5/8) only those observations reporting both total and low cloud amounts were summarized. This helps eliminate problems introduced as a result of using inconsistent observations from different size data bases (N-count). The use of satellite data bolsters confidence in the total cloud analyses because they show fairly close agreement with cloud cover analyses (U. S. Department of Commerce and United States Air Force, 1971).

The percent frequencies of total clouds less than or equal to two-eighths changes little across the Gulf of Mexico during an average annual cycle. Winter frequencies range from near 20 percent along the western edge, 30 percent in the central sections and 40 percent along the northern coast and in the vicinity of the Yucatan Peninsula. By mid-summer frequencies are near 30 percent for all areas.

Along the Pacific Coast of Region 4 a significant seasonal change takes place in the frequencies of total clouds between winter and summer. During January and February 70 to 80 percent of the total cloud observations report two-eighths or less. By July, less than 10 percent are reporting two-eighths or less.

From December through March low cloud amounts greater than or equal to five eighths are observed less than 10 percent of the time in the Pacific waters of Region 4. From June through October they average 30 to 40 percent. In the Gulf of Mexico, frequencies are generally slightly higher in the west than the east. During the winter, frequencies range from under 30 percent near the Yucatan Peninsula to over 50 percent at the western edge of the Gulf. By July most areas of the Gulf of Mexico have low clouds of five oktas or more less than 20 percent of the time. The exception is in the Bay of Campeche where frequencies run slightly higher at just over 30 percent.

Ceiling and Visibility

Aircraft-type ceilings are not available from marine observations. The ceilings are estimated from the height of the lowest cloud when low clouds cover more than half the sky. When the sky is totally obscured by rain, fog, dust, or other phenomena, the total obscuration is considered a ceiling with a height of zero. Mid-range ceiling and visibility charts (ceiling less than 1,000 feet and/or visibility less than 5 nautical miles; ceiling less than 8,000 feet and/or visibility less than 10 nautical miles) and low range ceiling and visibility charts (ceilings less than 300 feet and/or visibility less than 1 nautical mile; ceiling less than 600 feet and/or visibility less than 2 nautical miles) are presented.

Ceilings less than 8000 feet and/or visibilities less than 10 nautical miles are generally observed near 10 percent of the time in the Gulf of Tehuantepec during the winter and 30 to 40 percent of the time during the summer. In the Gulf of Mexico, January frequencies range from near 30 percent at the Yucatan Peninsula to 60 to 70

percent along the south Texas coast and Mexican coast from north of Tampico to south of Veracruz. By July frequencies range from just under 20 percent in the central sections to near 40 percent in the Bay of Campeche and Mississippi Delta - Florida Panhandle coastal region.

The next lower threshold presentation (ceilings less than 1000 feet and/or visibilities less than 5 nautical miles) has very similar patterns. Percent frequencies range from less than five percent during the winter to 15 to 20 percent in the summer across the Pacific Ocean section of Region 4. On the Atlantic side frequencies during January range from approximately 10 percent near the Yucatan Peninsula to 30 percent along its western edge. August brings the lowest occurrences, ranging from under 5 percent near the Yucatan Peninsula to just over 10 percent in the southwest corner of the Bay of Campeche.

The lowest threshold category (less than 300 feet and/or 1 nautical mile) exceeds 8 percent frequency during February along the Texas and Louisiana coast. This is the highest observed frequency for this category anywhere in the Gulf of Mexico and Caribbean sea study area. From May through November, frequencies in the Gulf of Mexico drop off to around one to two percent. In the Pacific frequencies run just over 2 percent during September, and less for the remaining months.

For ceilings less than 600 feet and/or visibilities less than two nautical miles frequencies run as high as 6 percent during September in the Pacific waters of Region 4. Percentages are less for the remaining months averaging less than 1 percent during the winter. In the Gulf of Mexico, as with the lowest threshold, February has the highest occurrences with frequencies ranging from under 2 percent near the Yucatan Peninsula to 11 percent near the Texas-Louisiana border. November shows the highest percentage of observations reporting less than 600 feet and/or less than 2 miles in the western third of the Gulf of Mexico, with percentage frequencies reaching 10 percent in the southwest corner of the Bay of Campeche. June observations show the least occurrences of any month with most from the Gulf of Mexico reporting close to two percent.

Wave-Heights

Wave-heights have been recorded in a consistent quantitative code only since the late 1940's. The reluctance of many observers to take wave observations in the earlier years and the difficulty in estimating waves, especially in confused seas, make wave observations one of the least commonly observed elements. They are also subject to biases. Generally the heights are too low, the periods too short, and the sea-swell discrimination poor (Quayle, 1980). The data in this study have not been adjusted for the suspected biases but they were processed through a quality control procedure where an internal check was made between wind speed and sea height. The data were also matrix-arrayed and apparent erroneous outliers were deleted in both the sea and swell data. Wave-height presentations include isopleth maps showing percent frequencies of wave-heights $\geq$ 3 feet and $\geq$ 8 feet. In addition, wave-height tables by one-degree quadrangle show frequencies by six wave-height categories. In these presentations, the higher of the sea or swell was selected for summarization. If heights were equal, the wave with the longer period was selected.

Wave-heights of three feet or higher are observed 70 to 80 percent of the time across the open waters of the Gulf of Mexico from November through April. Some areas along the continental shelf during these months average as low as 30 to 40 percent. Frequencies of three foot or higher waves during the other half of the year generally average some 10 to 20 percent lower. In the Pacific section frequencies of three foot waves or greater average 70 to 80 percent from June through October. Frequencies between 40 and 70 percent are observed during the remaining months with the higher frequencies being centered over the Gulf of Tehuantepec.

Wave height of eight feet or greater are observed less than 10 percent of the time in the Gulf of Mexico from May through August and near 10 percent for the other months. Frequencies do reach 20 percent over the western half of the Bay of Campeche during January.

From March through September waves of eight feet or greater are observed near 10 percent of the time across the Pacific section of Region 4. Frequencies near 30 percent are observed during the remaining five months.

Ocean Currents

The ocean current charts are compiled principally from ship drift reports that were forwarded by the various merchant marines to the Naval Oceanographic Office. From these drift observations, the set (direction) and drift (speed) of the prevailing currents are calculated for each one-degree square. The density of observations is greatest along the major shipping routes and the reliability of the current charts is best in these areas. The data are considered most useful when used collectively as such in summaries where a large number of observations are available.

Surface current charts displayed for Region 4 are Winter (Jan., Feb., Mar.), Spring (Apr., May, Jun.), Summer (Jul., Aug., Sep.) and Autumn (Oct., Nov., Dec.).

Summary

Large variations in the weather are not experienced at scales that exist in the higher latitudes except during the passage of seasonal tropical cyclones and depressions. In general, weather conditions are pleasant with small diurnal temperature ranges and small intermonthly temperature variations. This is especially true for the marine areas. Land site weather can vary much more depending on elevation, local effects, cloud cover, land and sea breeze, and the effects of ocean currents and sea temperatures. In addition to the persistently warm temperatures, high humidities prevail especially over lowlands and ocean areas.

At lower elevations daily temperatures generally range from nighttime lows in the 60° to 70°F's to daytime highs of 80° and 90°F's. Temperatures at elevations above 10,000 feet will average 10° to 20°F lower. Below 3,000 feet, extreme temperatures rarely drop below 40°F although they occasionally rise above 100°F.

Hurricanes are certainly the most destructive natural force in the region. Their associated storm surges prove to be the most damaging phenomenon to low-lying coastal areas, because they often rise 10 to 15 feet above normal tide level. Flooding and mudslides also prove dangerous with both usually resulting from a passing hurricane.

Although migratory low pressure systems, such as easterly waves and tropical cyclones, strongly influence the weather from time to time, it is the constancy of the trade winds and high sun angle that establishes the regional climate.

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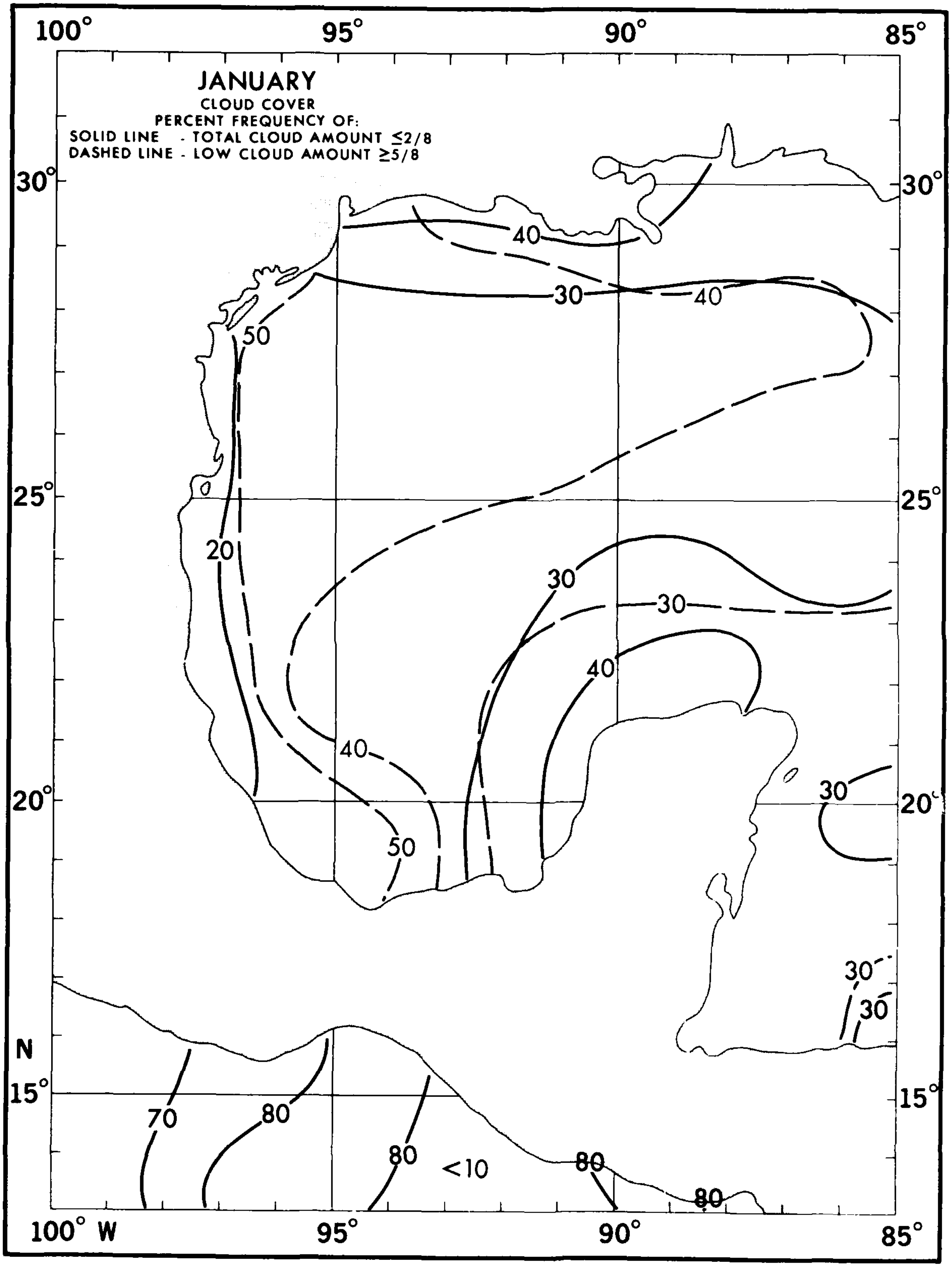
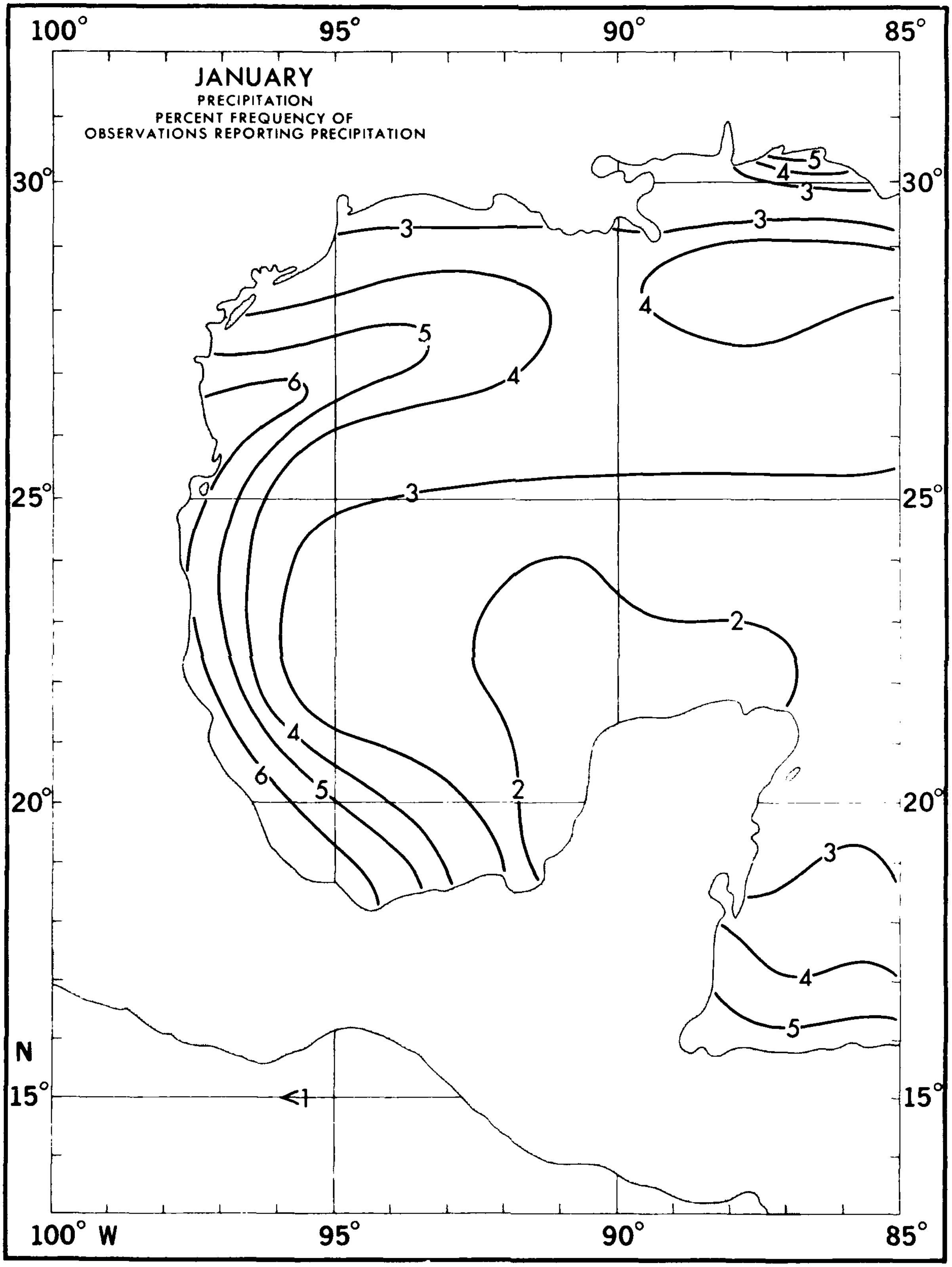
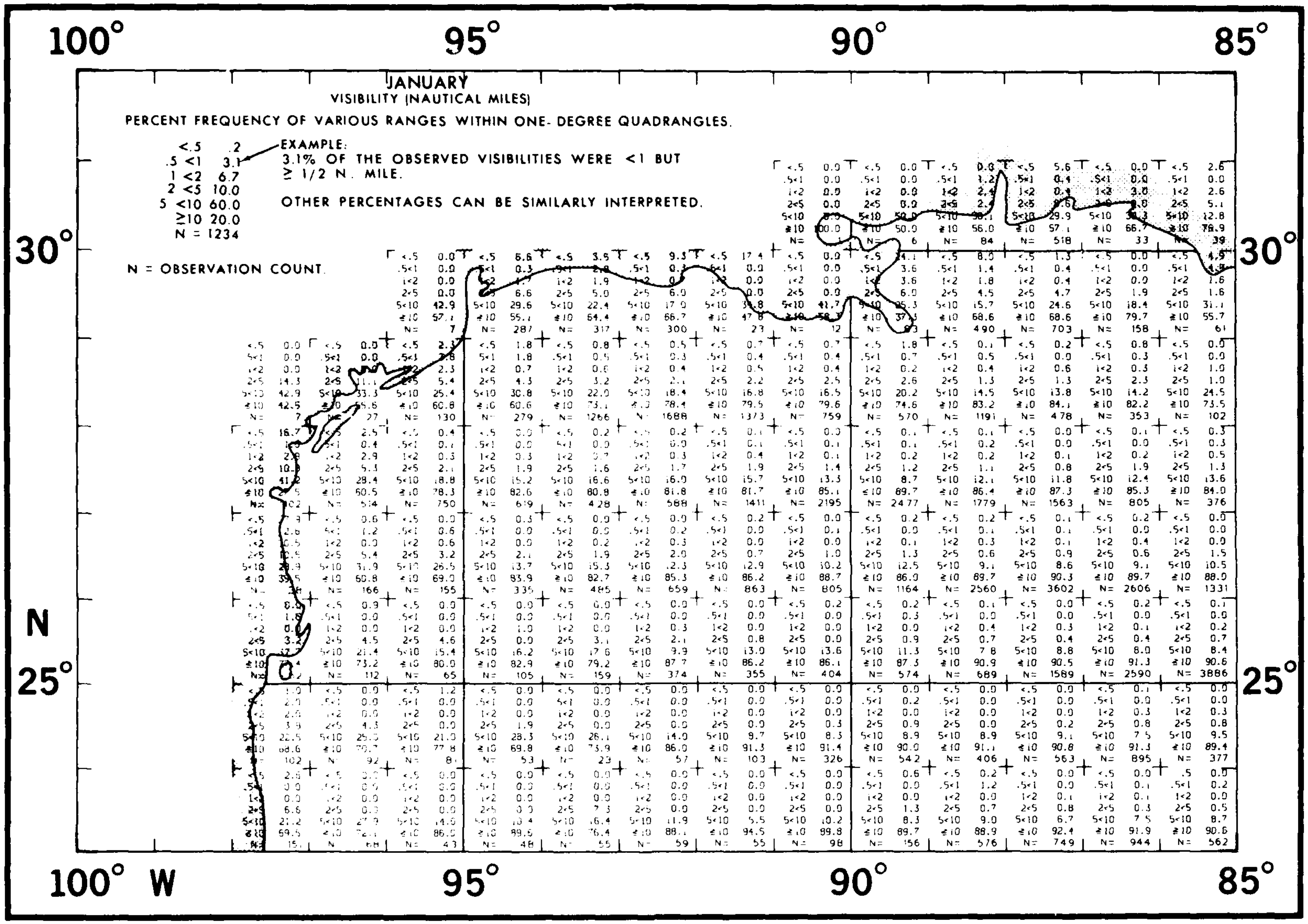
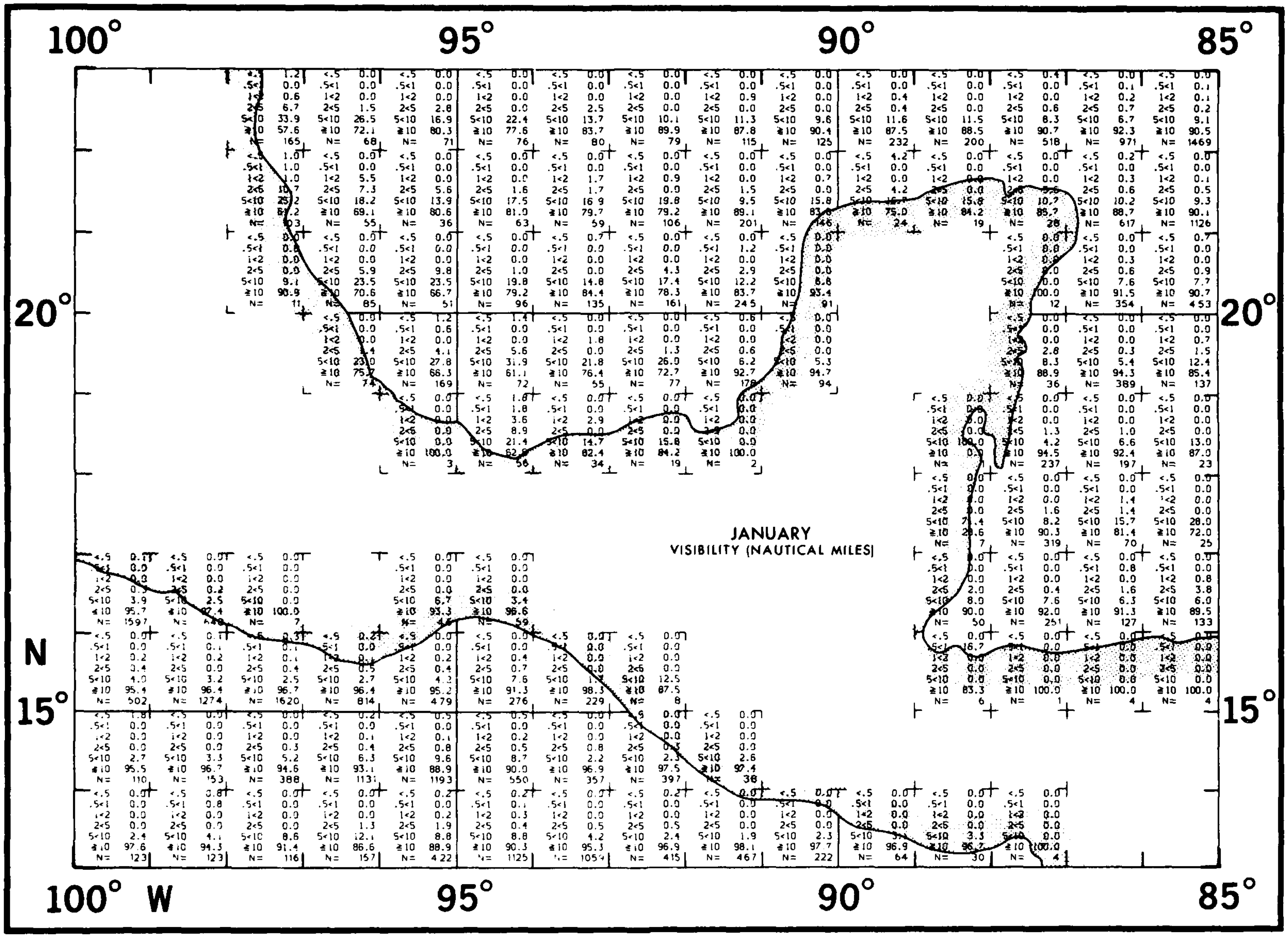
MONTH \ ELEMENT	CLOUDS	PRECIPITATION	VISIBILITY-TABLES	CEILING-VISIBILITY (mid range)	CEILING-VISIBILITY (low range)	WIND-VISIBILITY-CLOUDINESS	SCALAR MEAN WIND SPEED	WIND SPEED <11 and ≥34 knots	WIND SPEED 11-21 and 22-33 knots	SURFACE WIND ROSES	AIR AND SEA TEMPERATURE	WAVE HEIGHT-ISOPLETHS	WAVE HEIGHT-TABLES	SURFACE CURRENTS (seasonal)
JANUARY	2	3	4	6	7	8	9	10	11	12	14	15	16	194 THRU 198
FEBRUARY	18	19	20	22	23	24	25	26	27	28	30	31	32	
MARCH	34	35	36	38	39	40	41	42	43	44	46	47	48	
APRIL	50	51	52	54	55	56	57	58	59	60	62	63	64	
MAY	66	67	68	70	71	72	73	74	75	76	78	79	80	
JUNE	82	83	84	86	87	88	89	90	91	92	94	95	96	
JULY	98	99	100	102	103	104	105	106	107	108	110	111	112	
AUGUST	114	115	116	118	119	120	121	122	123	124	126	127	128	
SEPTEMBER	130	131	132	134	135	136	137	138	139	140	142	143	144	
OCTOBER	146	147	148	150	151	152	153	154	155	156	158	159	160	
NOVEMBER	162	163	164	166	167	168	169	170	171	172	174	175	176	
DECEMBER	178	179	180	182	183	184	185	186	187	188	190	191	192	

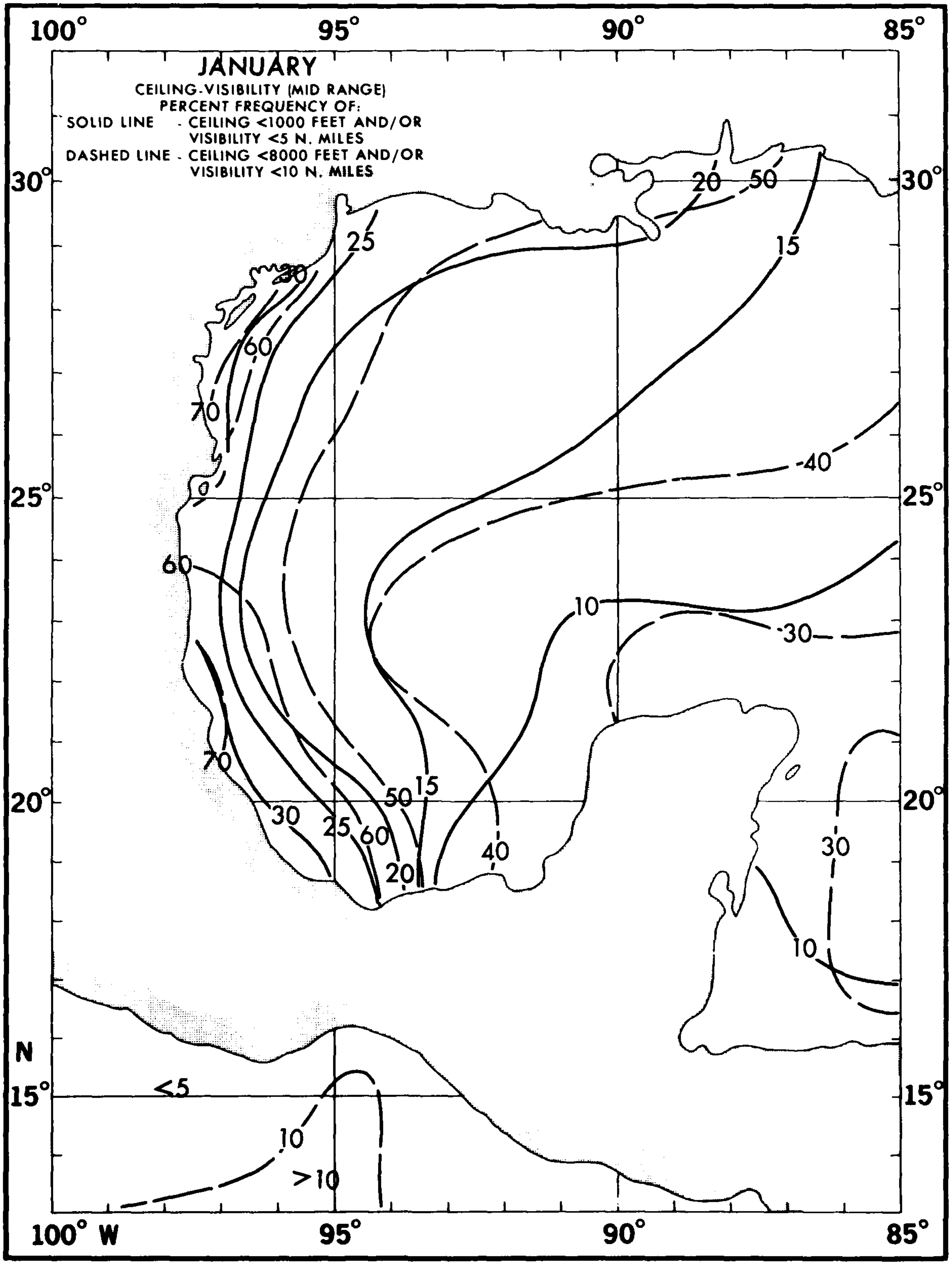


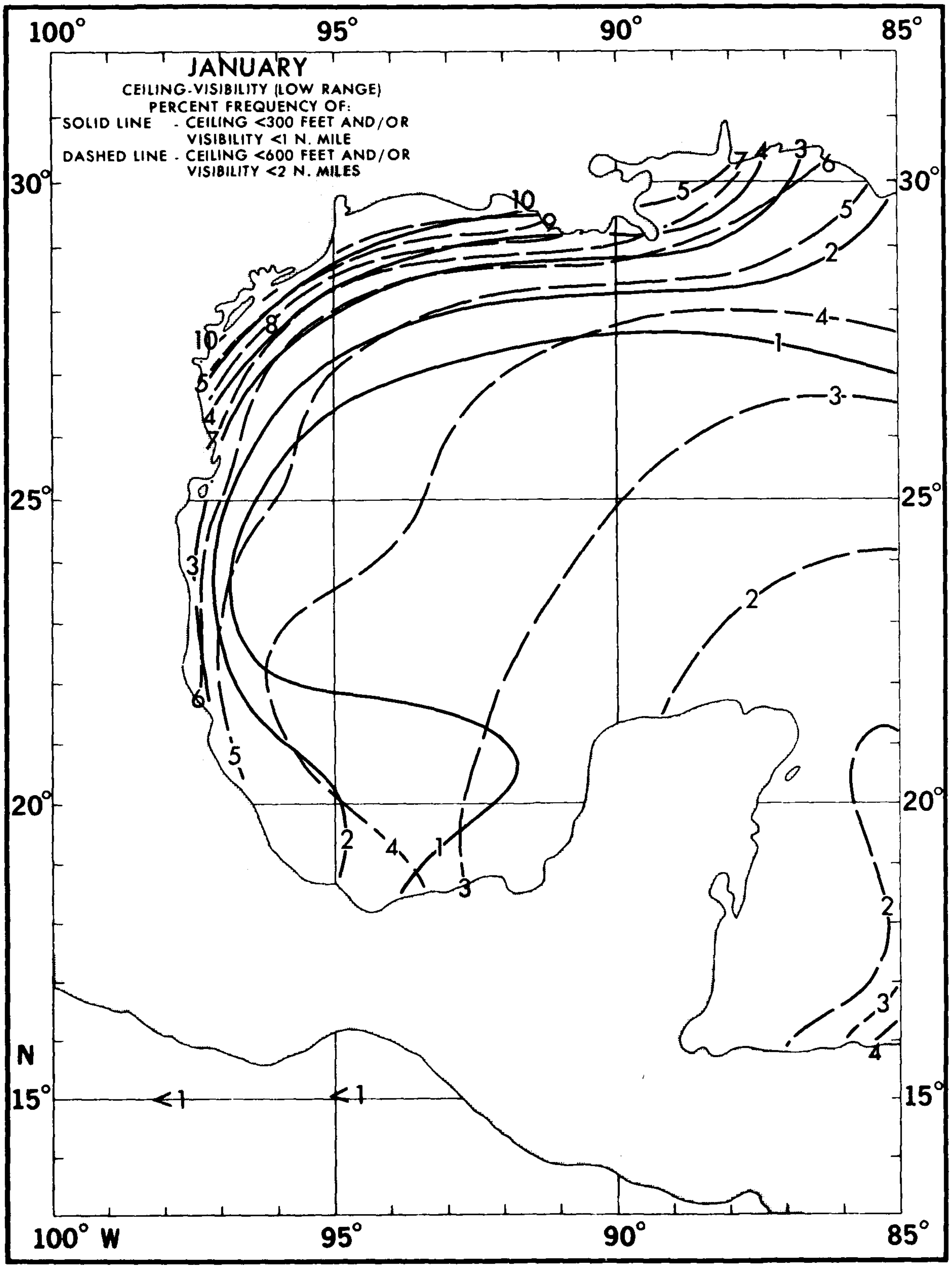
JANUARY
CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE - TOTAL CLOUD AMOUNT ≤2/8
DASHED LINE - LOW CLOUD AMOUNT ≥5/8
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
40
30
40
50
20
30
30
40
40
50
30
30
30
70
80
80
<10
80
80

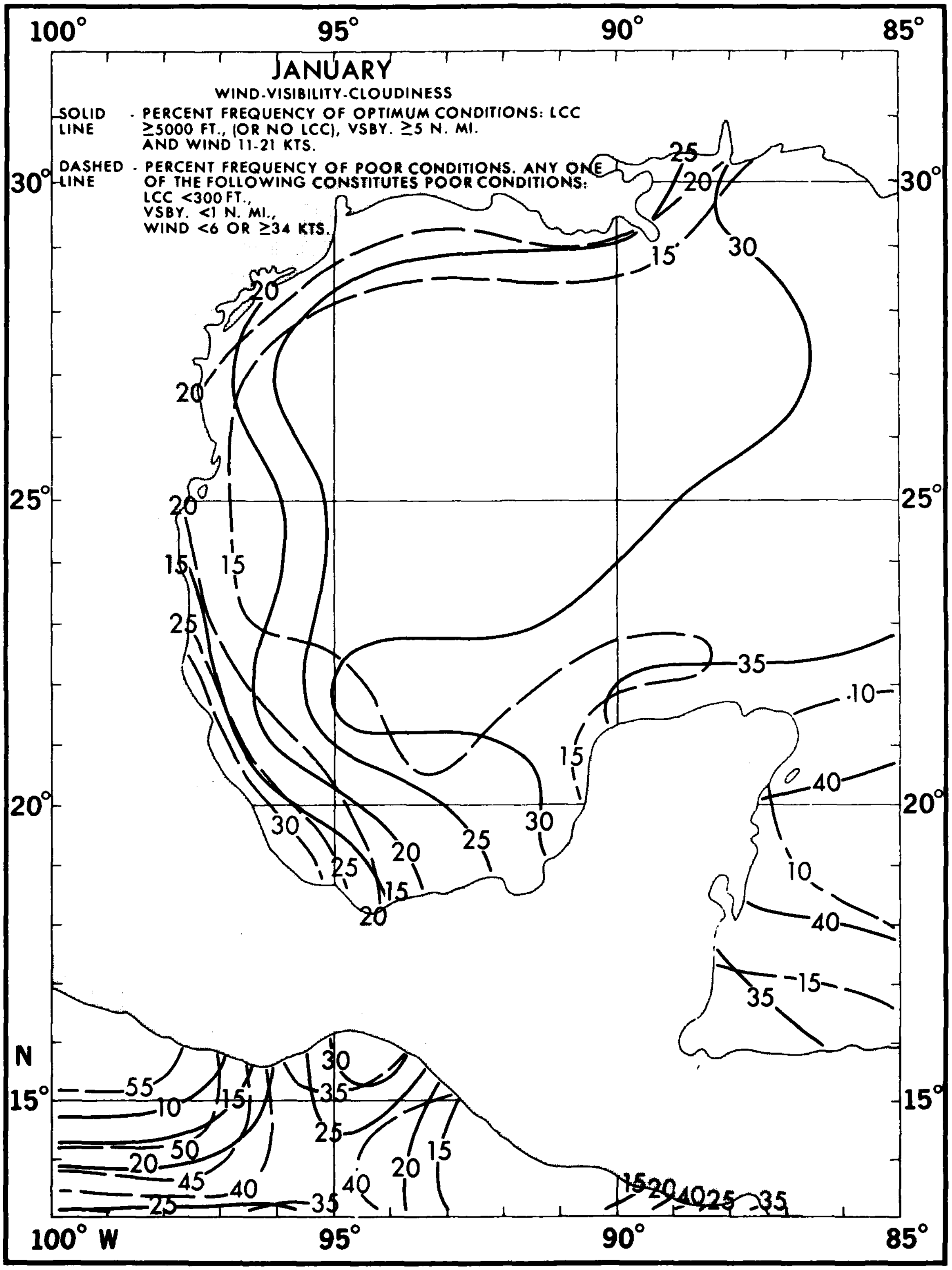

JANUARY
PRECIPITATION
PERCENT FREQUENCY OF
OBSERVATIONS REPORTING PRECIPITATION
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
3
4
5
6
2
<1


JANUARY
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
<.5 .2
.5 <1 3.1
1 <2 6.7
2 <5 10.0
5 <10 60.0
≥10 20.0
N = 1234
EXAMPLE:
3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥ 1/2 N. MILE.
OTHER PERCENTAGES CAN BE SIMILARLY INTERPRETED.
N = OBSERVATION COUNT.
100°
95°
90°
85°
30°
25°
N
100° W

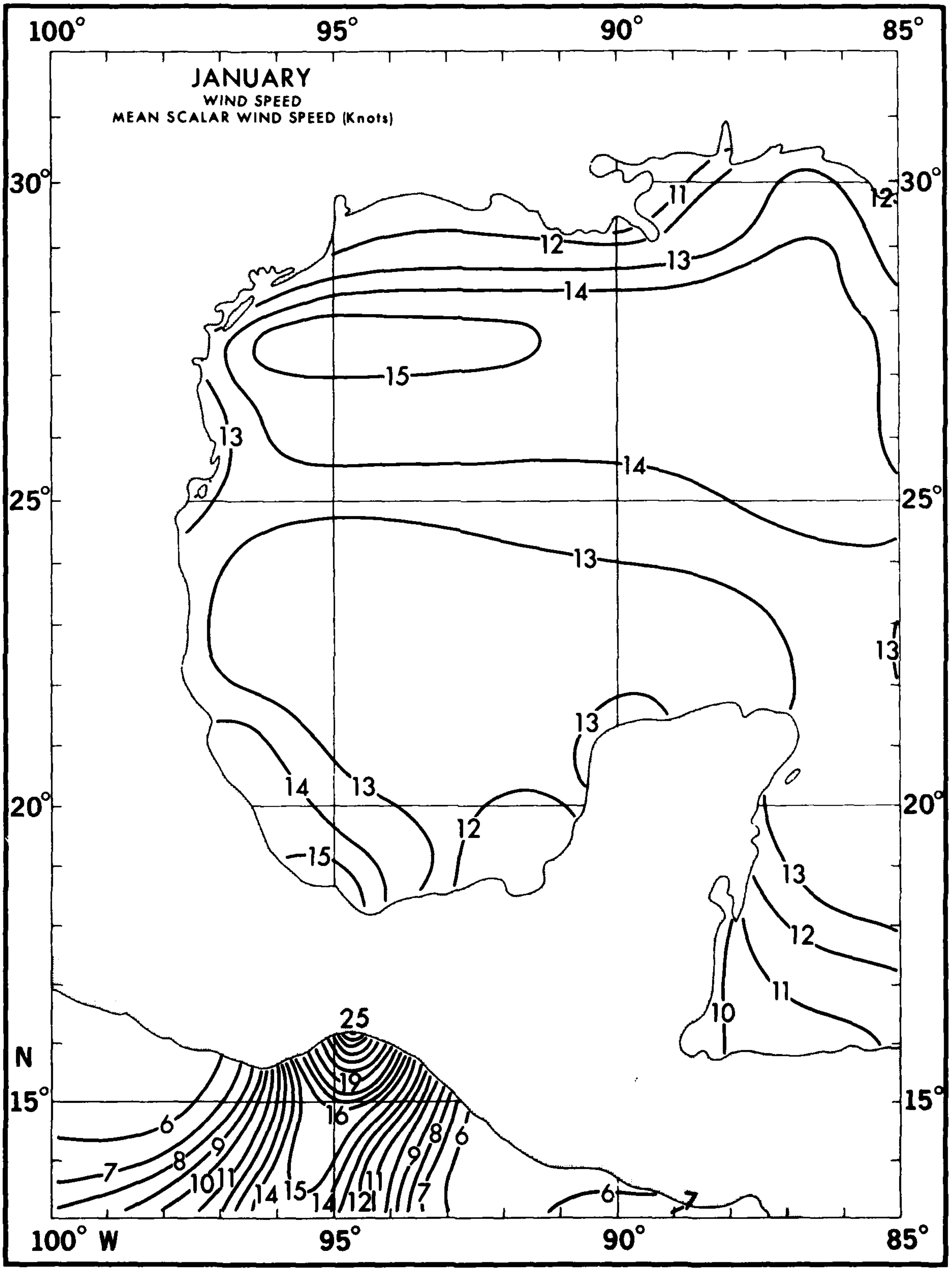

JANUARY
VISIBILITY (NAUTICAL MILES)
100°
95°
90°
85°
20°
15°
N
100° W

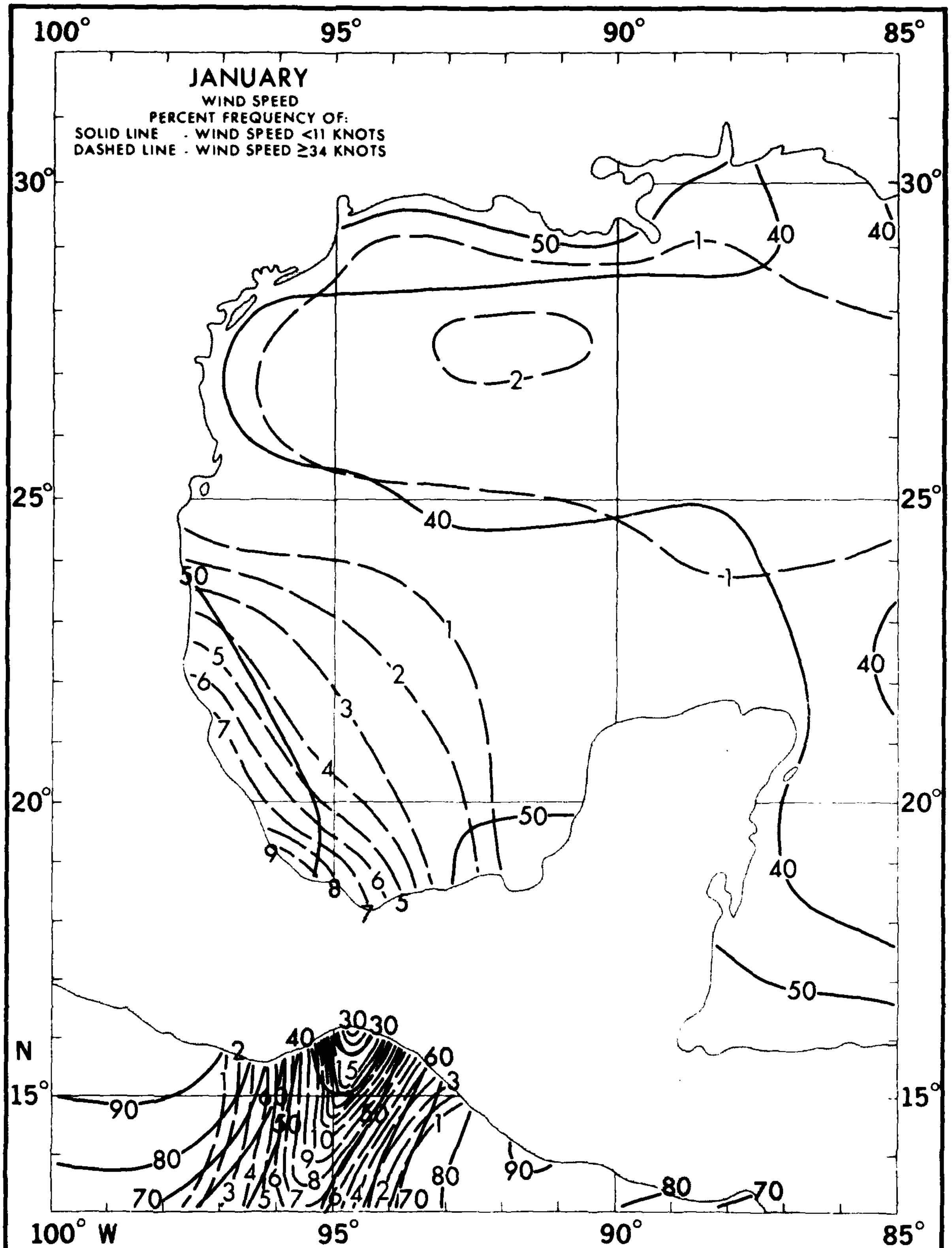

JANUARY
CEILING-VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES
DASHED LINE - CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
20
50
25
30
15
60
70
40
10
30
70
60
50
15
30
25
60
20
40
30
10
<5
10
>10

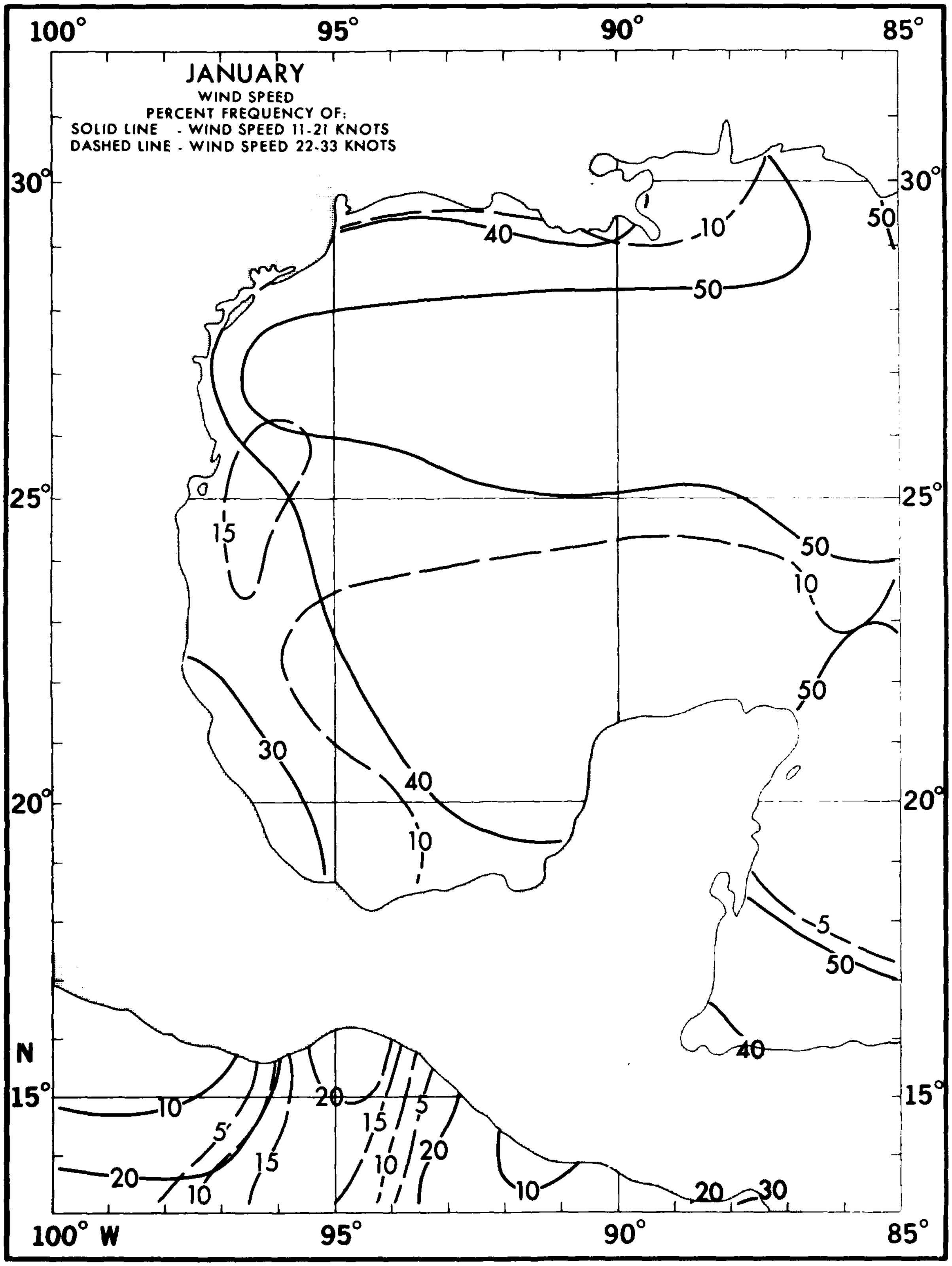

JANUARY
CEILING-VISIBILITY (LOW RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <300 FEET AND/OR
VISIBILITY <1 N. MILE
DASHED LINE - CEILING <600 FEET AND/OR
VISIBILITY <2 N. MILES
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
<1
<1

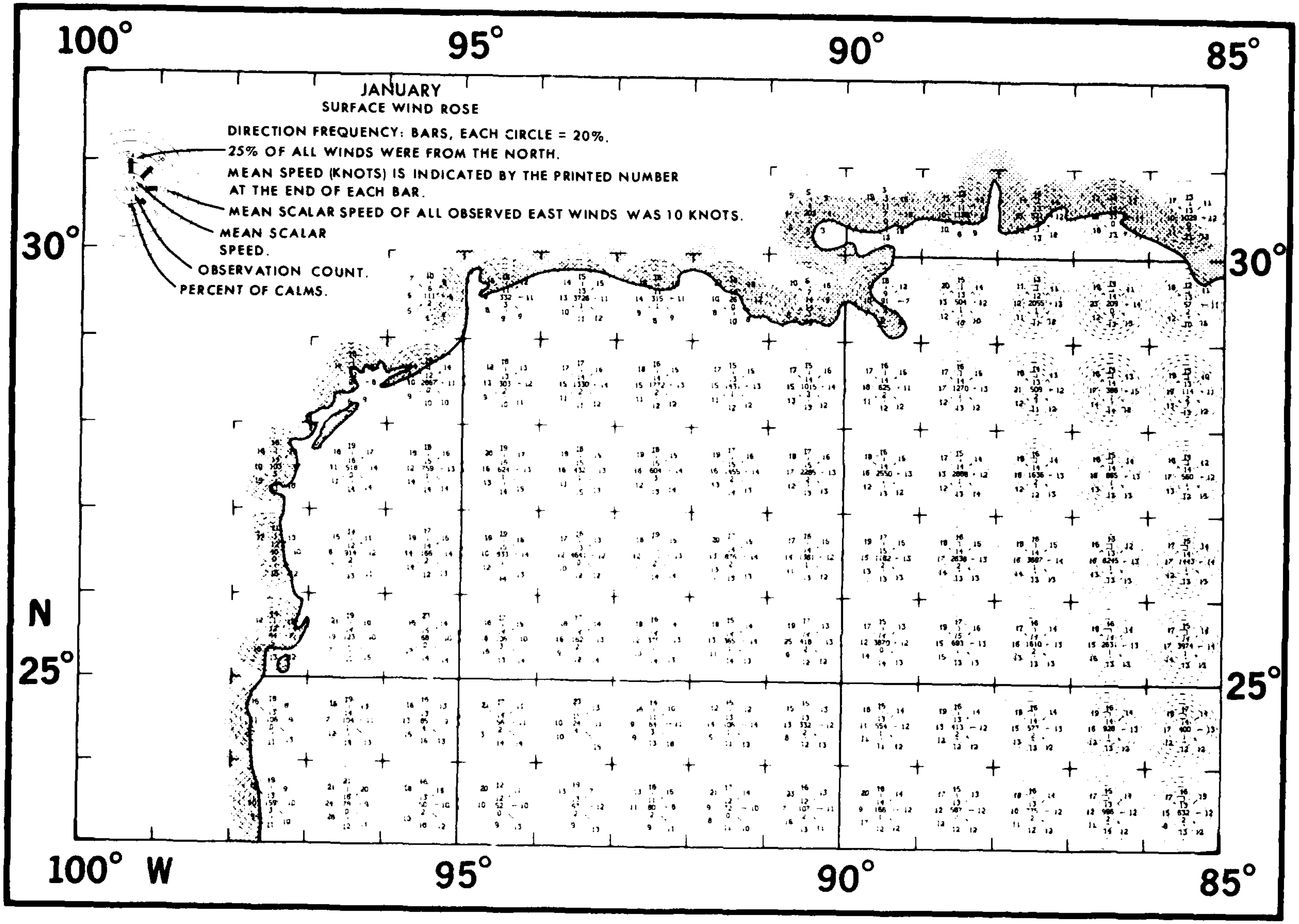


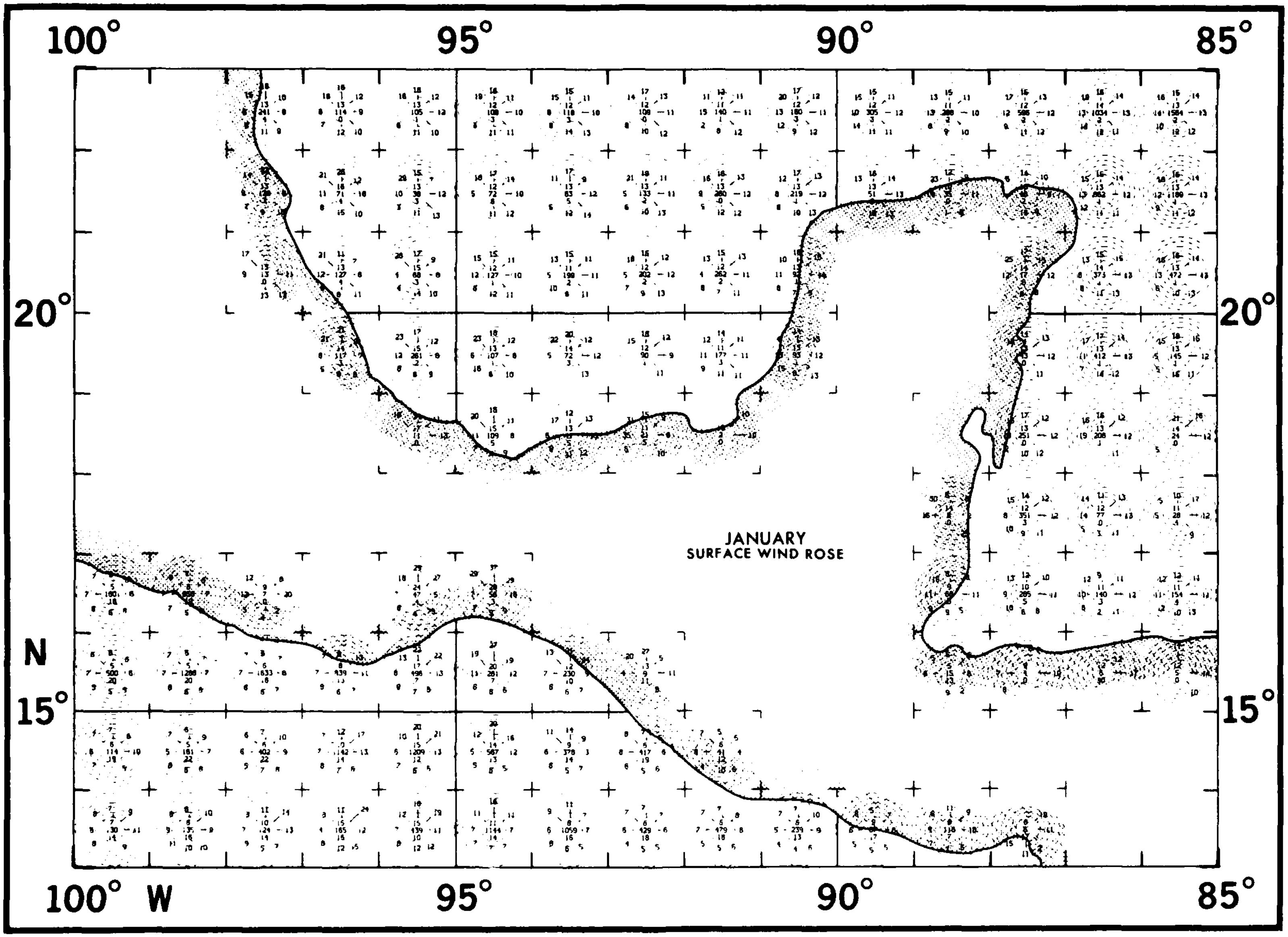
JANUARY
WIND-VISIBILITY-CLOUDINESS
SOLID LINE - PERCENT FREQUENCY OF OPTIMUM CONDITIONS: LCC ≥5000 FT., (OR NO LCC), VSBY. ≥5 N. MI. AND WIND 11-21 KTS.
DASHED LINE - PERCENT FREQUENCY OF POOR CONDITIONS. ANY ONE OF THE FOLLOWING CONSTITUTES POOR CONDITIONS: LCC <300 FT., VSBY. <1 N. MI., WIND <6 OR ≥34 KTS.
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W

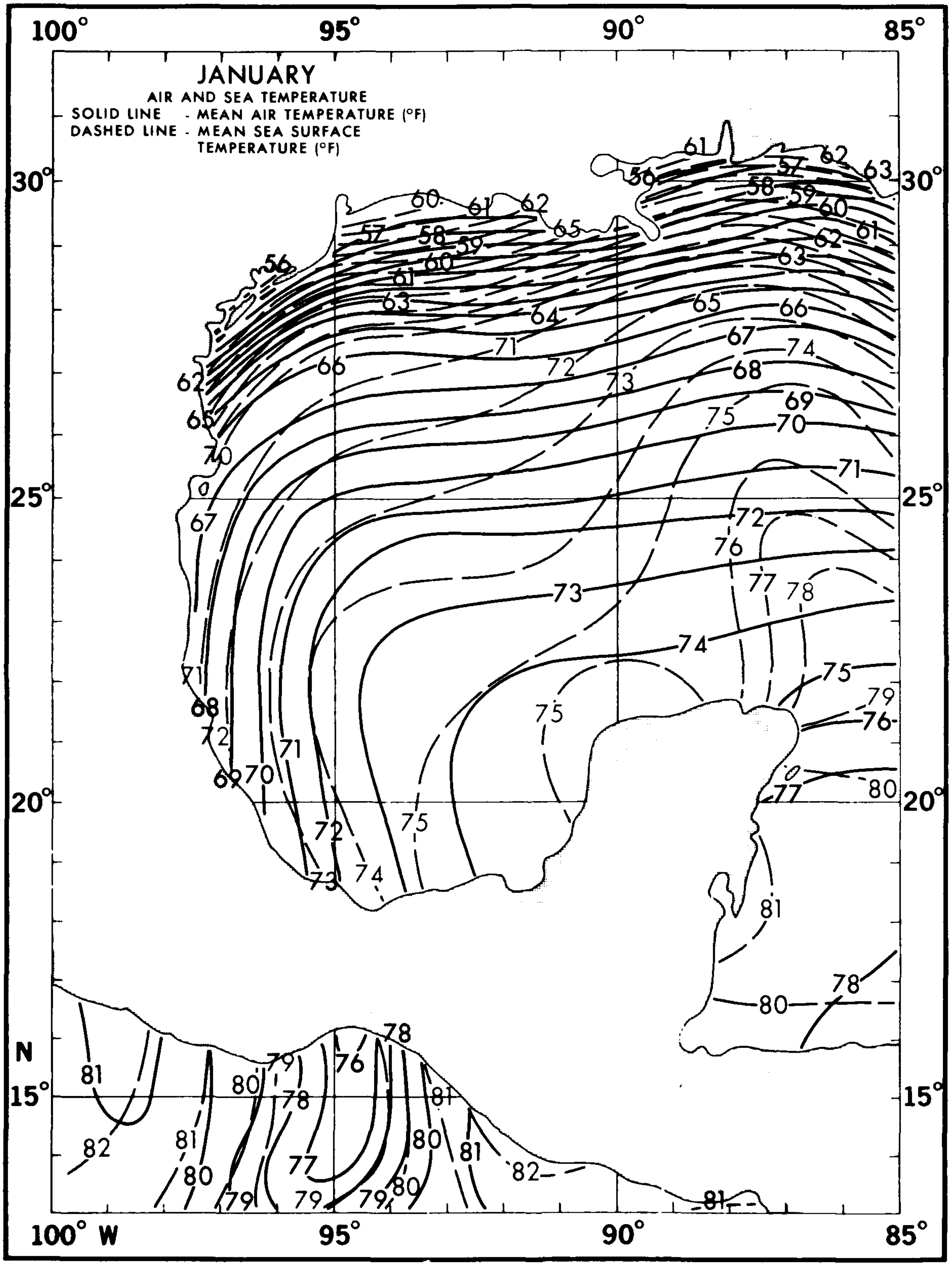

JANUARY
WIND SPEED
MEAN SCALAR WIND SPEED (Knots)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
11
12
13
14
15
25
19
16
10
6
7
8
9

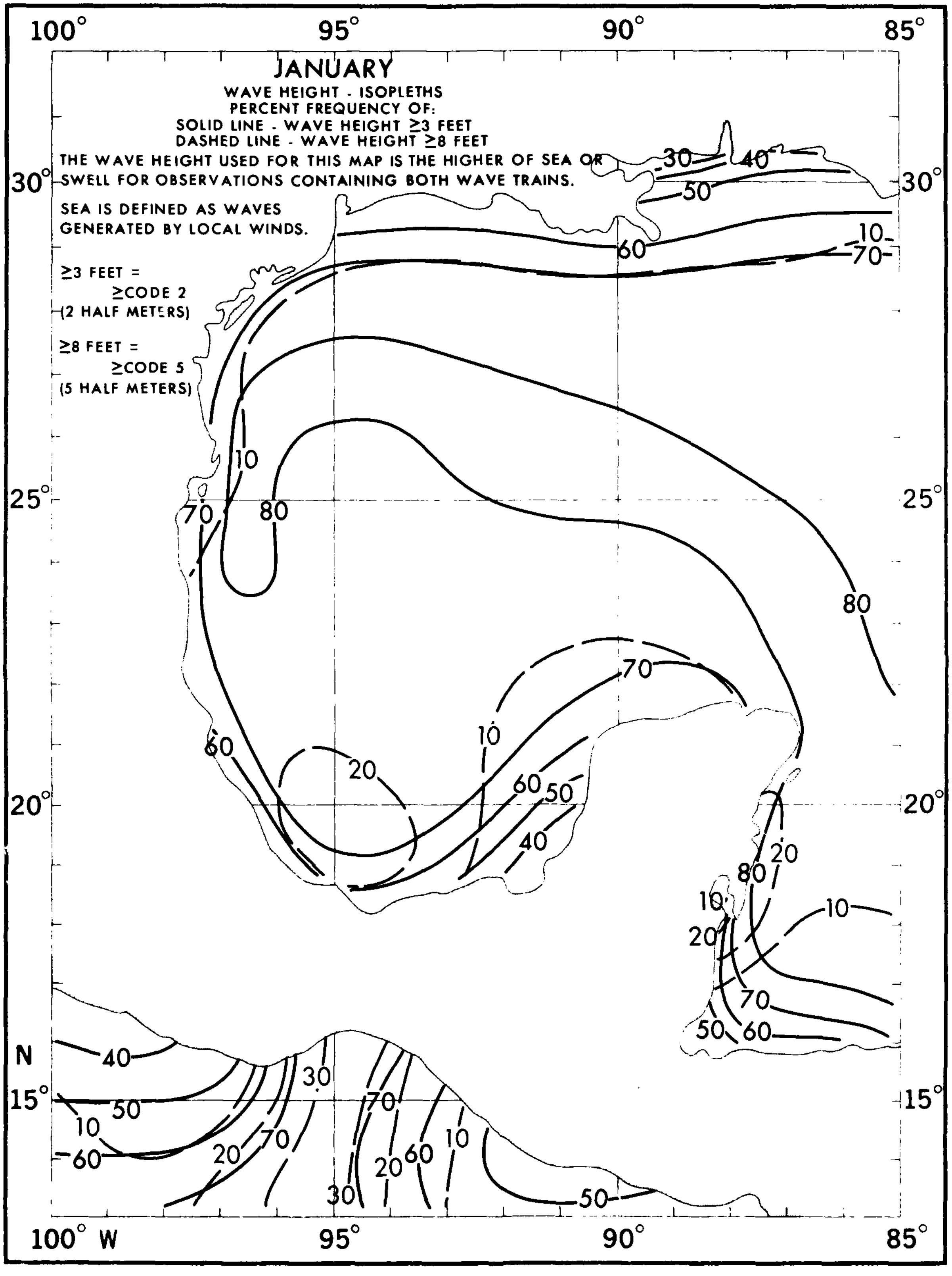

JANUARY
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED <11 KNOTS
DASHED LINE - WIND SPEED ≥34 KNOTS
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W


JANUARY
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED 11-21 KNOTS
DASHED LINE - WIND SPEED 22-33 KNOTS
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
40
10
50
15
30
5
20

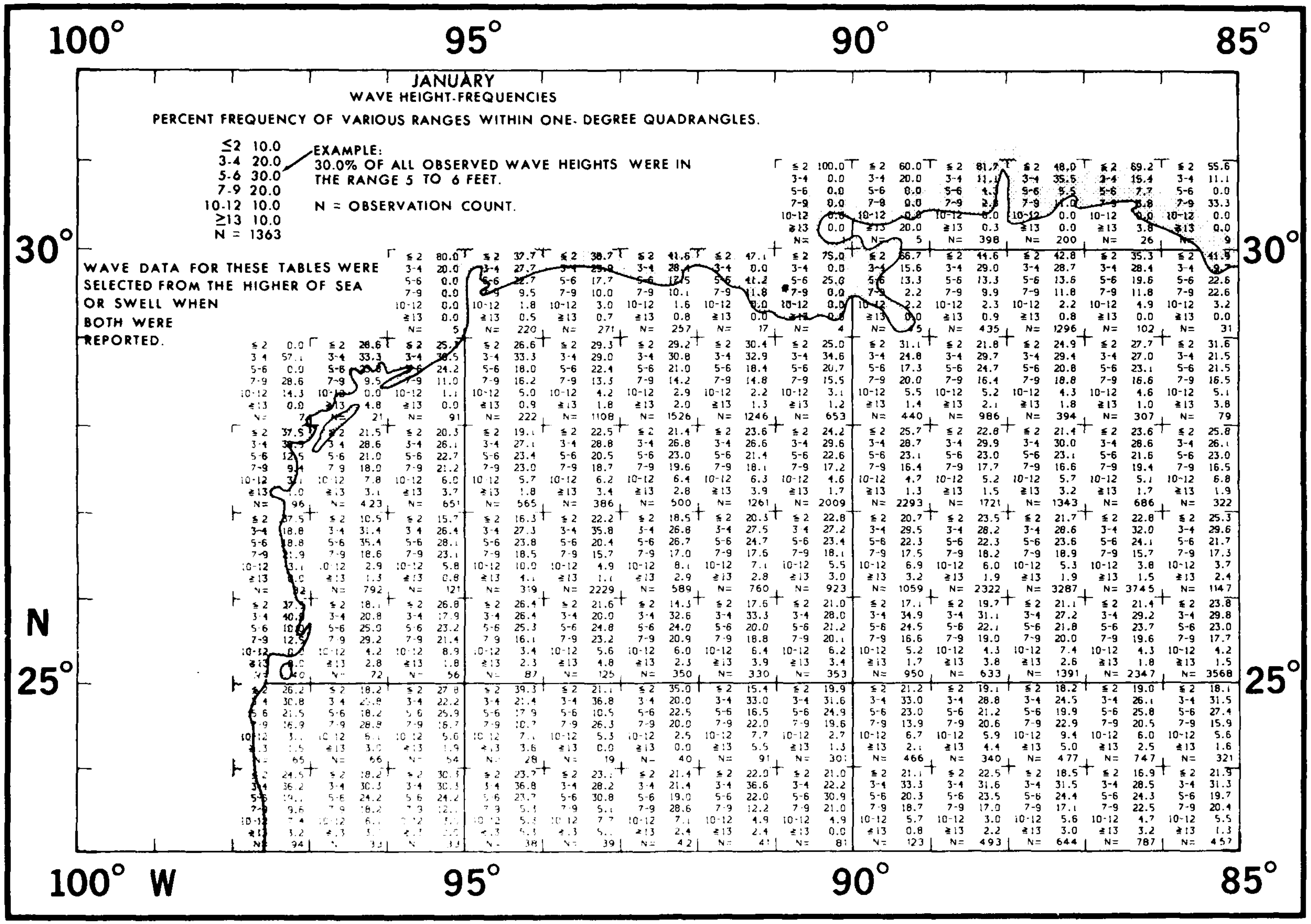

JANUARY
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM THE NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
100°
95°
90°
85°
30°
25°
N
100° W
95°
90°
85°


100°
95°
90°
85°
20°
15°
N
100° W
JANUARY
SURFACE WIND ROSE

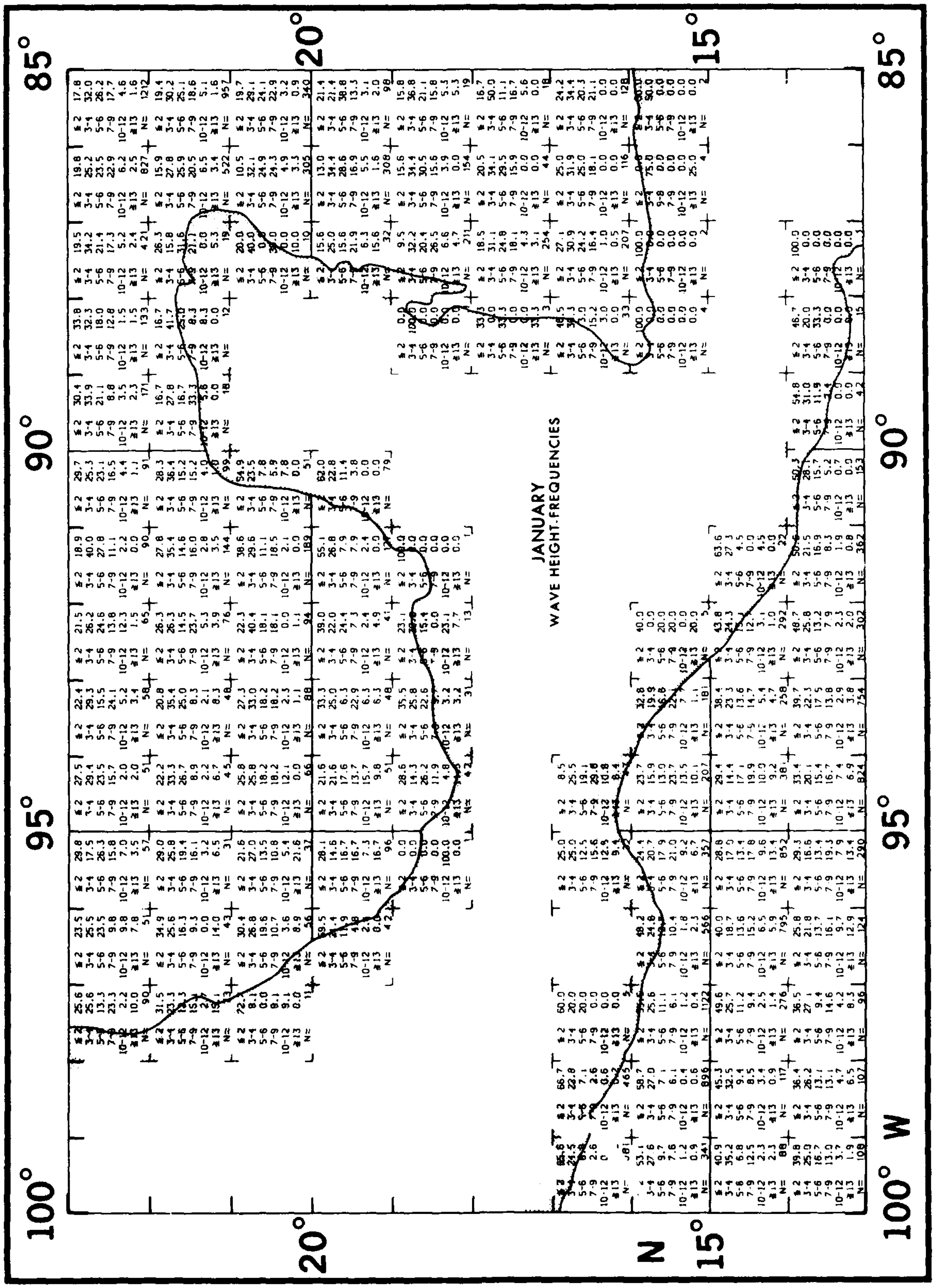

JANUARY
AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W

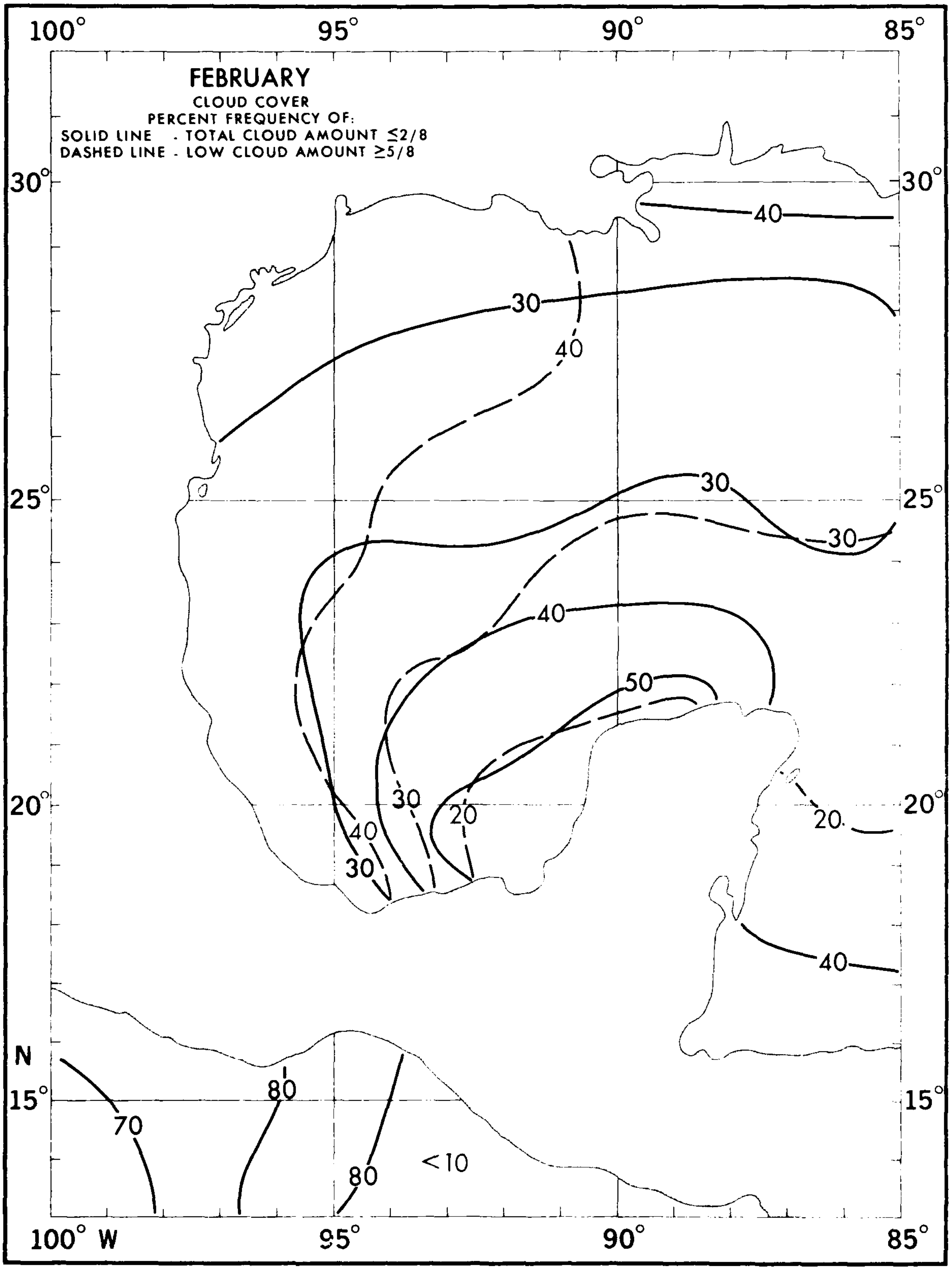


JANUARY
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
SOLID LINE - WAVE HEIGHT ≥3 FEET
DASHED LINE - WAVE HEIGHT ≥8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS.
SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W

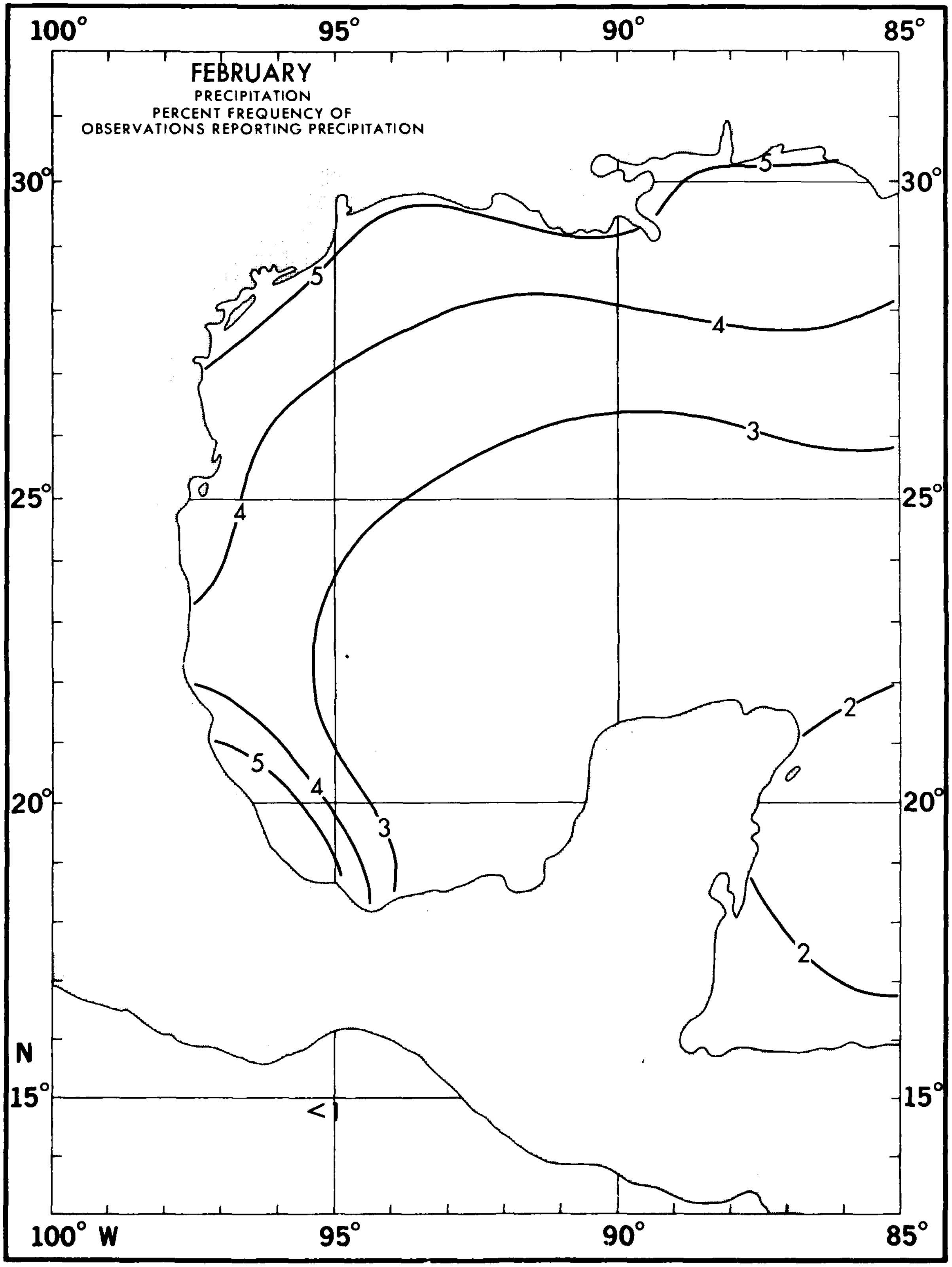


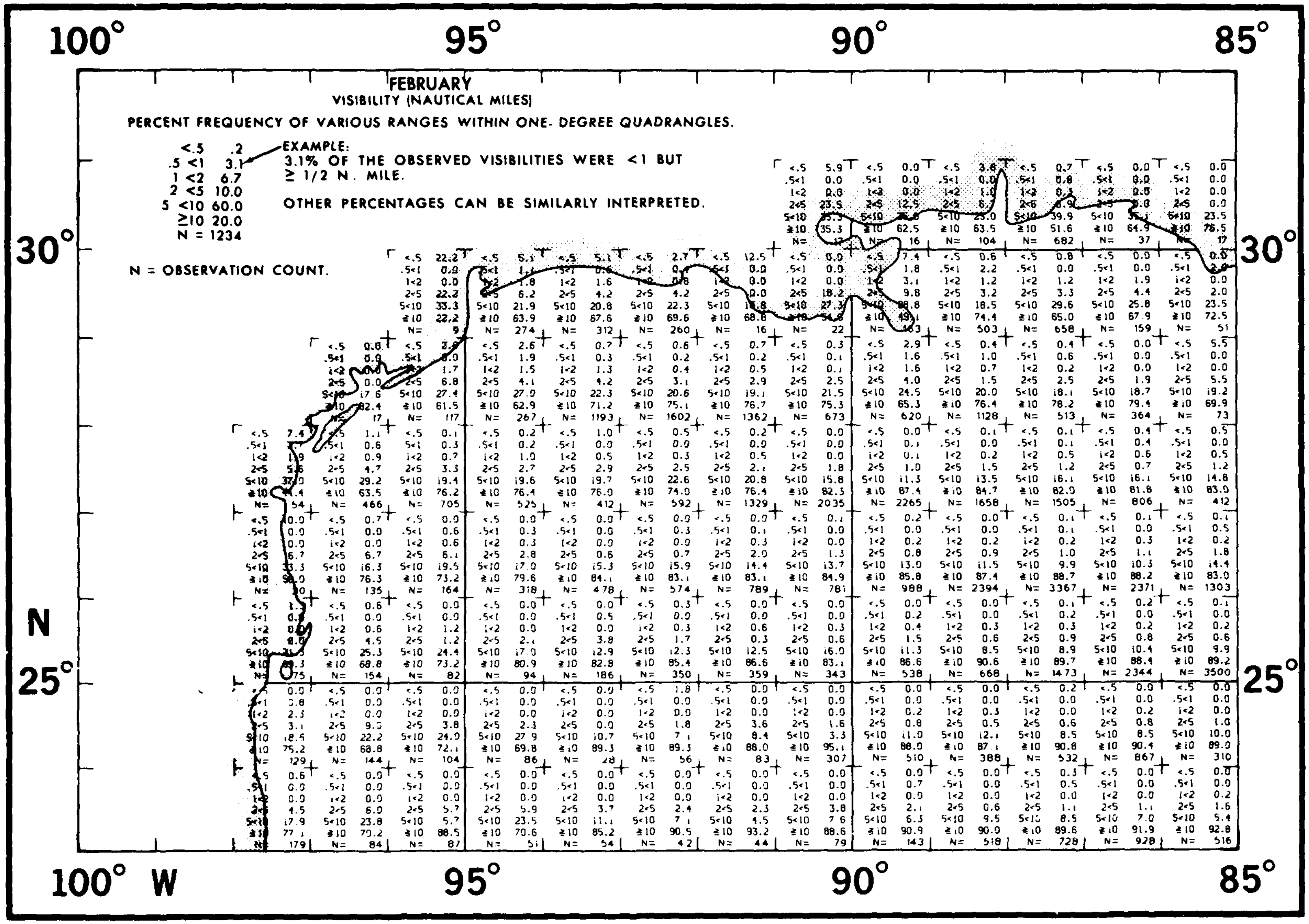
JANUARY
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
EXAMPLE:
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
100°
95°
90°
85°
30°
25°
N
100° W

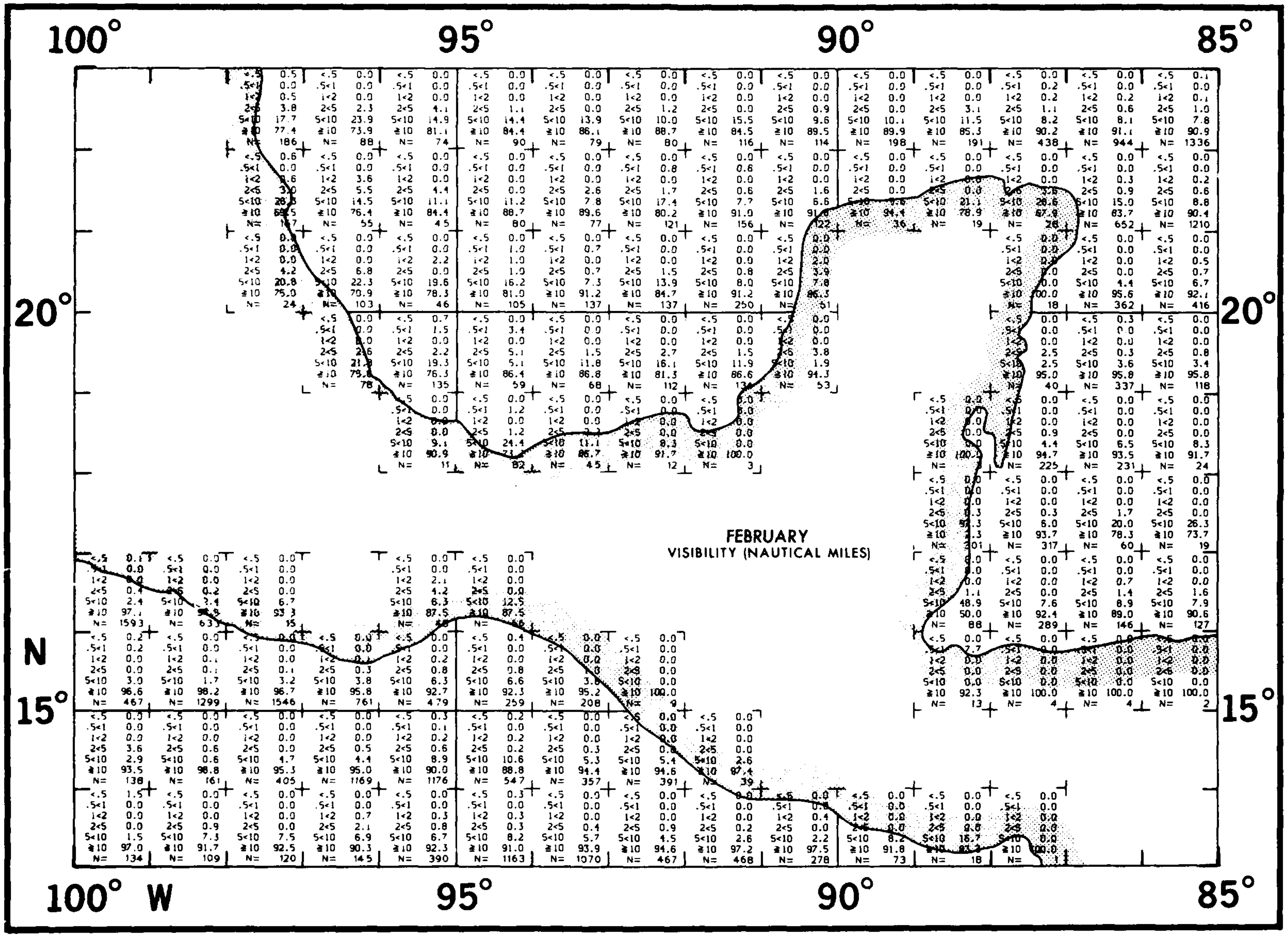

JANUARY
WAVE HEIGHT-FREQUENCIES
100° W
95°
90°
85°
20°
15°
N

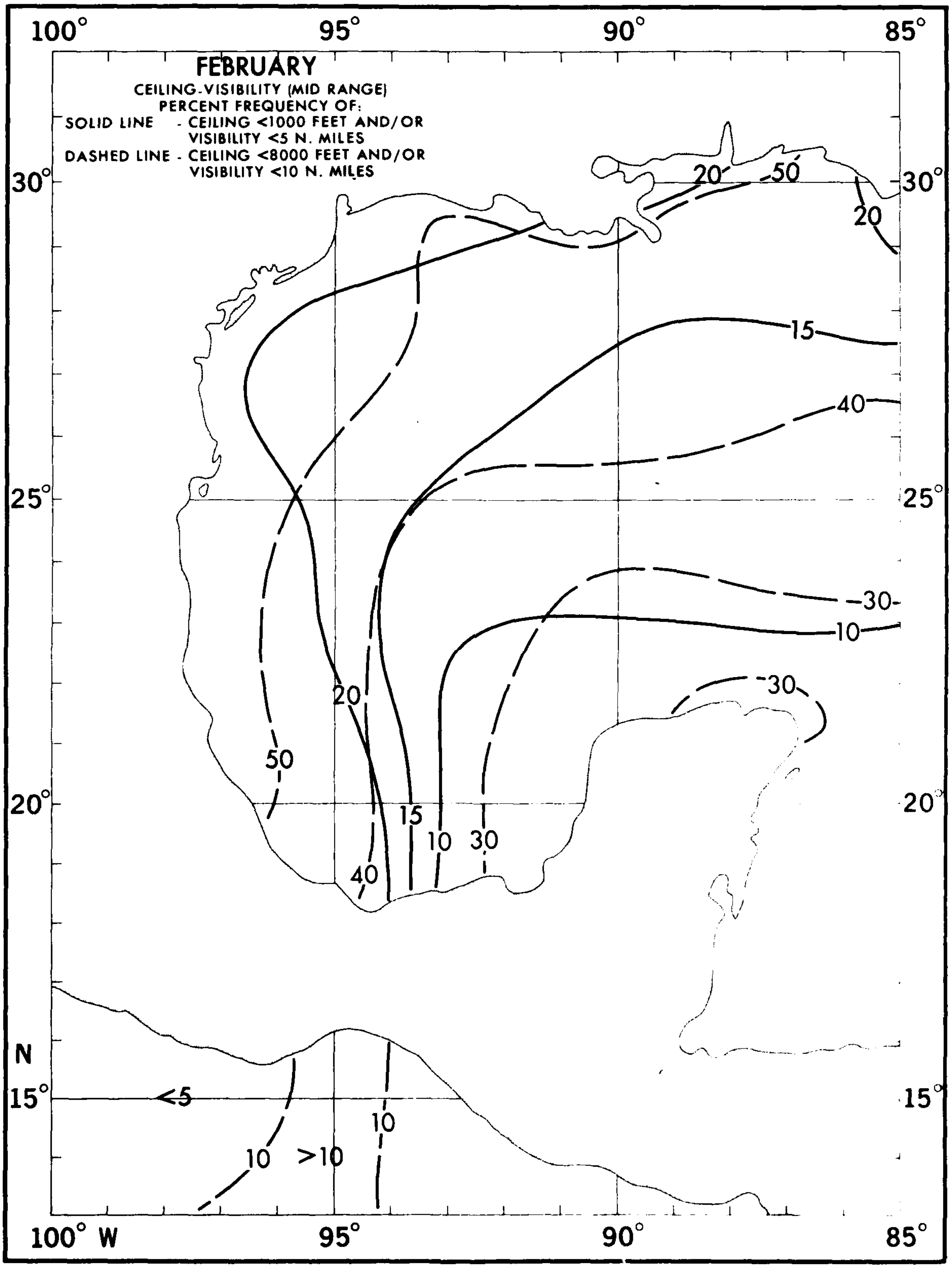


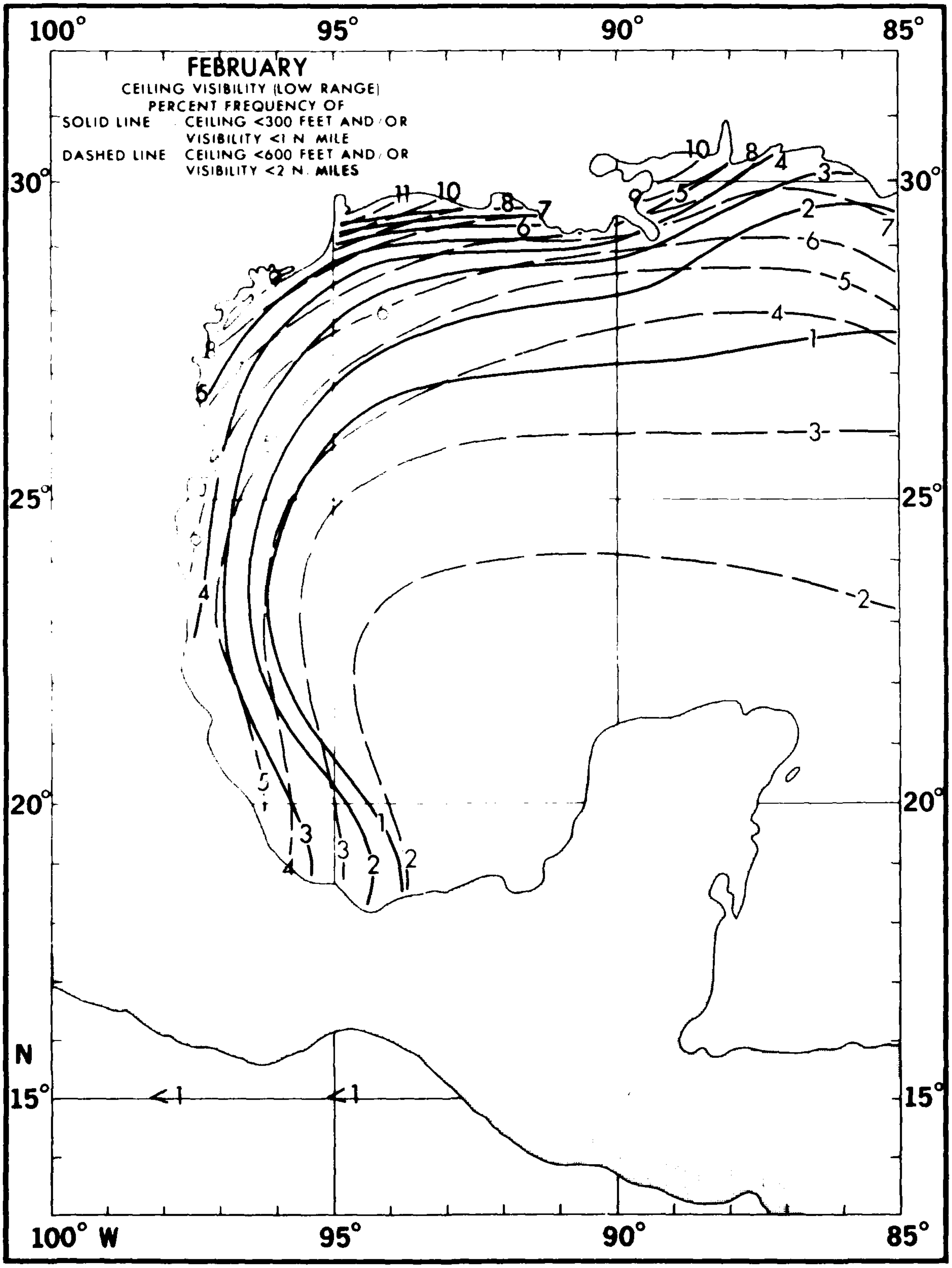
FEBRUARY
CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE - TOTAL CLOUD AMOUNT ≤2/8
DASHED LINE - LOW CLOUD AMOUNT ≥5/8
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
40
30
50
20
70
80
<10

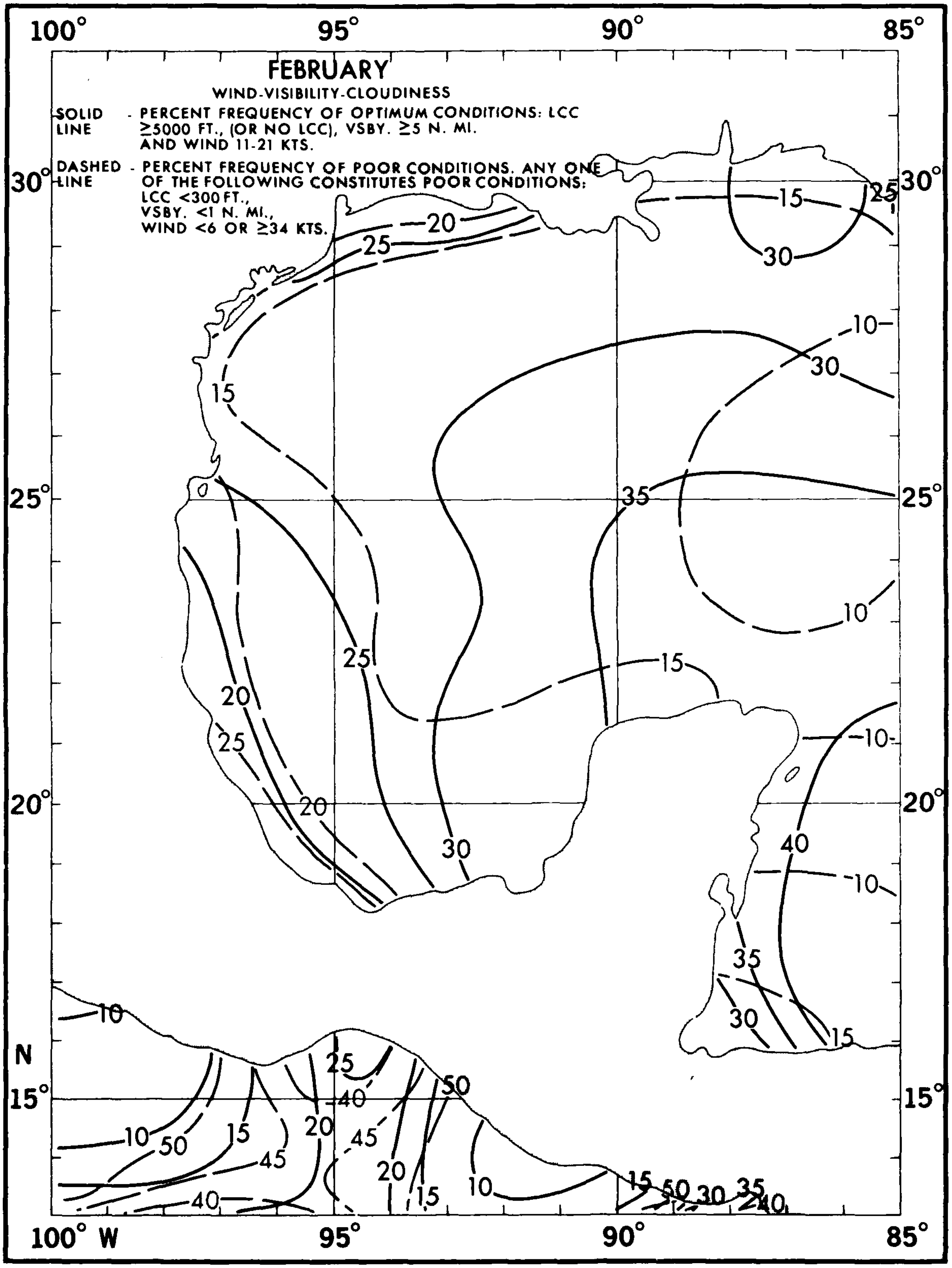

FEBRUARY
PRECIPITATION
PERCENT FREQUENCY OF
OBSERVATIONS REPORTING PRECIPITATION
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
5
4
3
2
<1

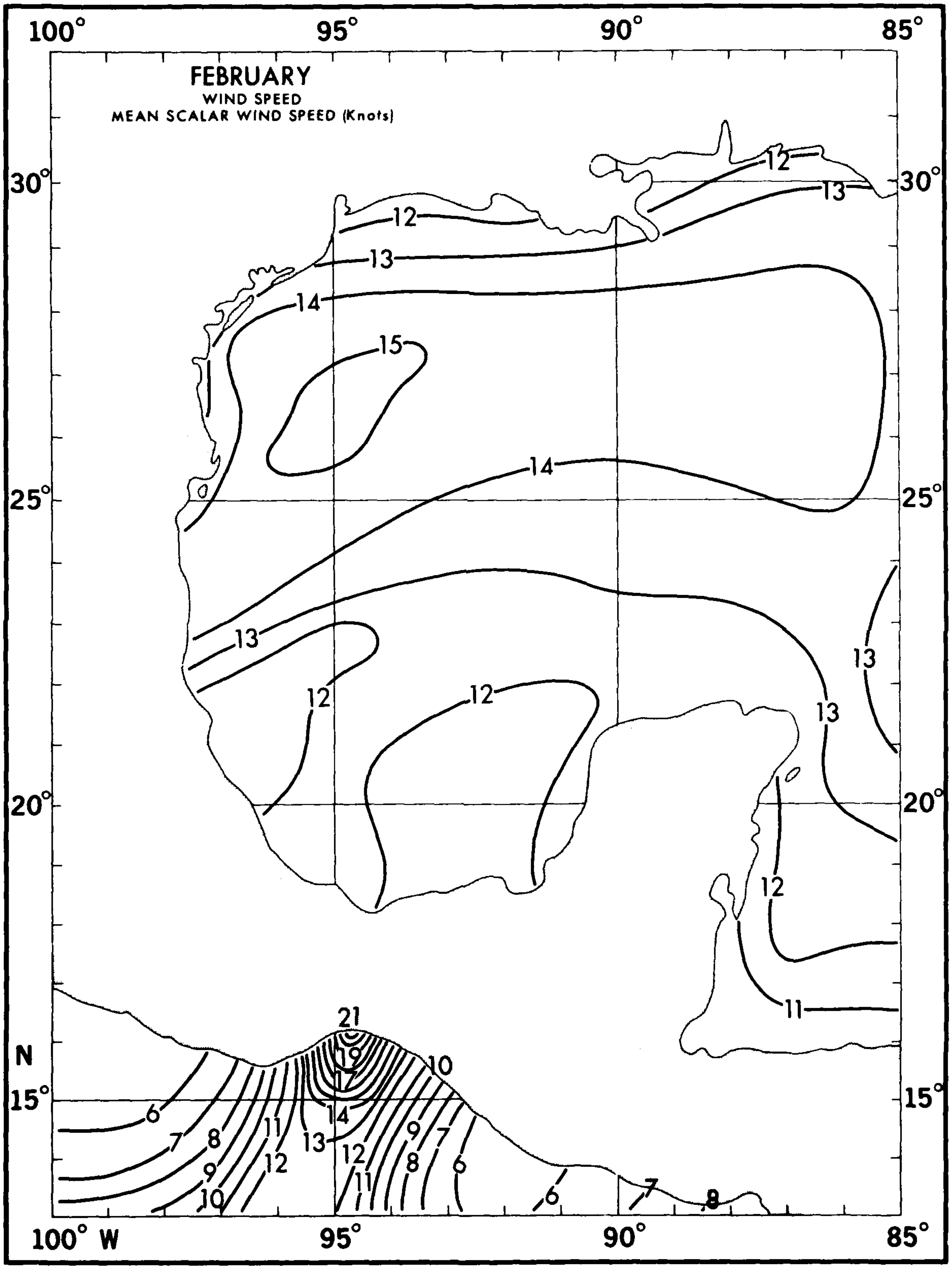

FEBRUARY
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE- DEGREE QUADRANGLES.
<.5 .2
.5 <1 3.1
1 <2 6.7
2 <5 10.0
5 <10 60.0
≥10 20.0
N = 1234
EXAMPLE:
3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥ 1/2 N. MILE.
OTHER PERCENTAGES CAN BE SIMILARLY INTERPRETED.
N = OBSERVATION COUNT.
100°
95°
90°
85°
30°
25°
N
100° W

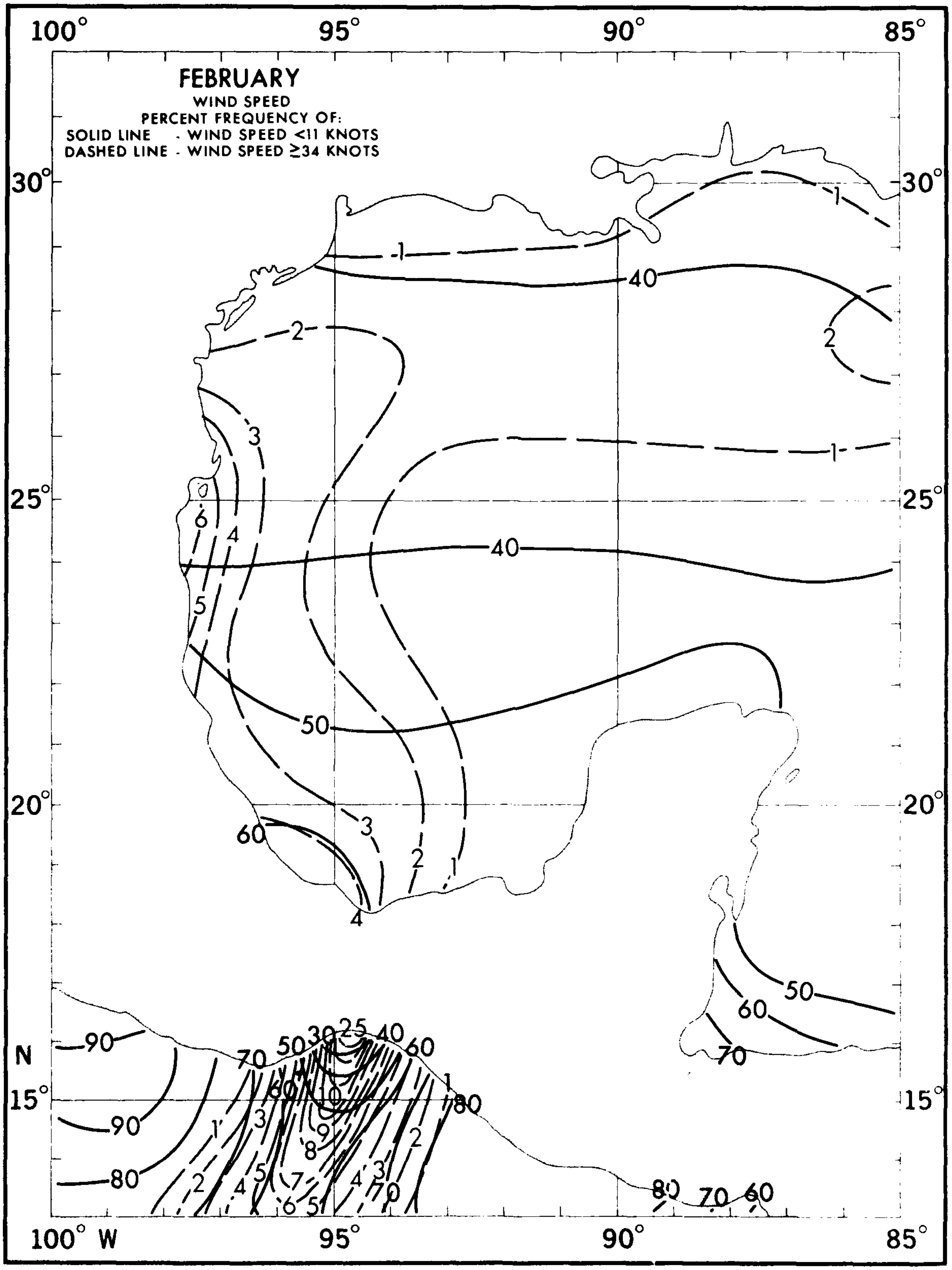

100°
95°
90°
85°
20°
15°
N
100° W
FEBRUARY
VISIBILITY (NAUTICAL MILES)

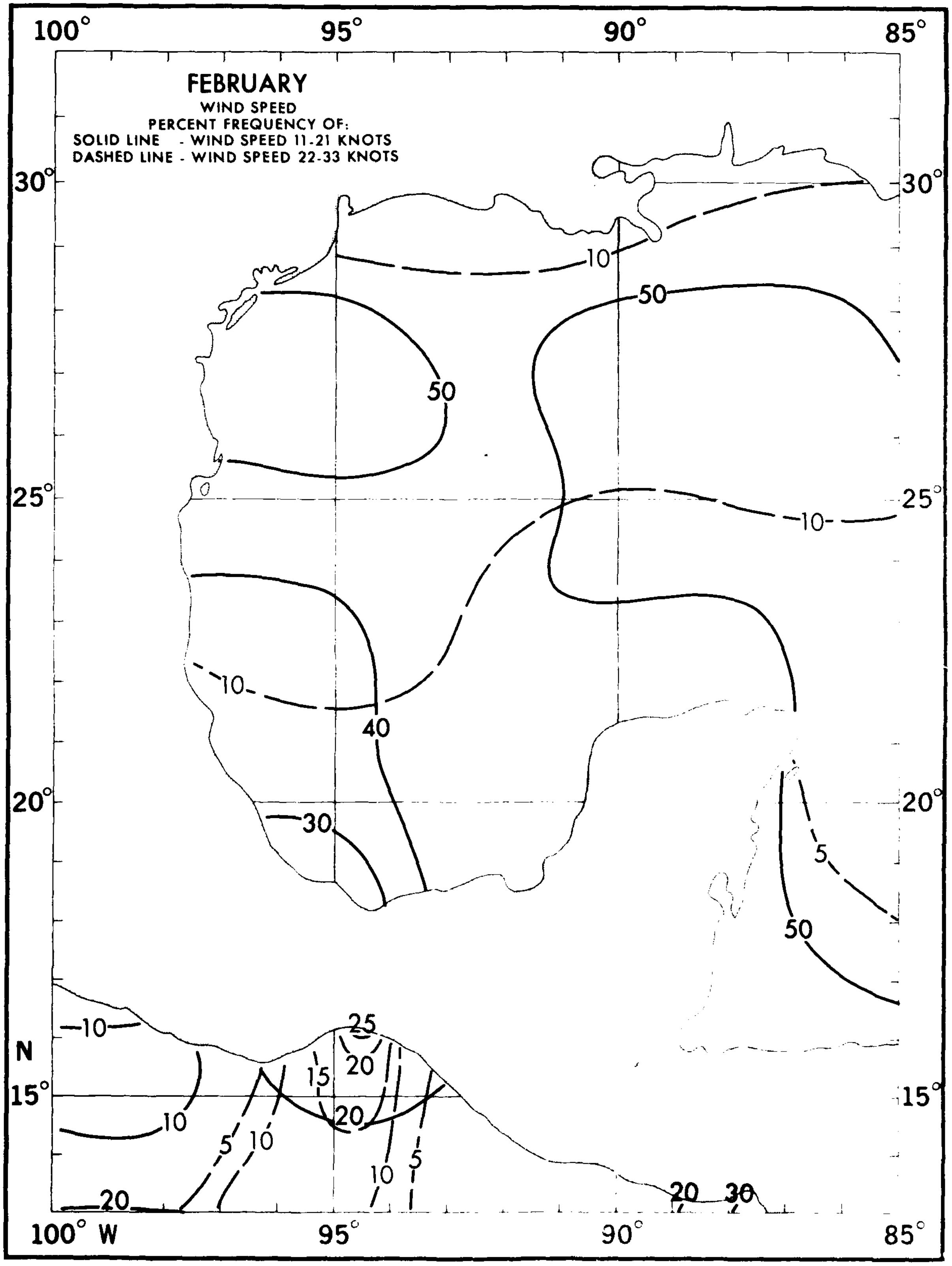

FEBRUARY
CEILING-VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES
DASHED LINE - CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
20
50
15
40
30
10
<5
>10

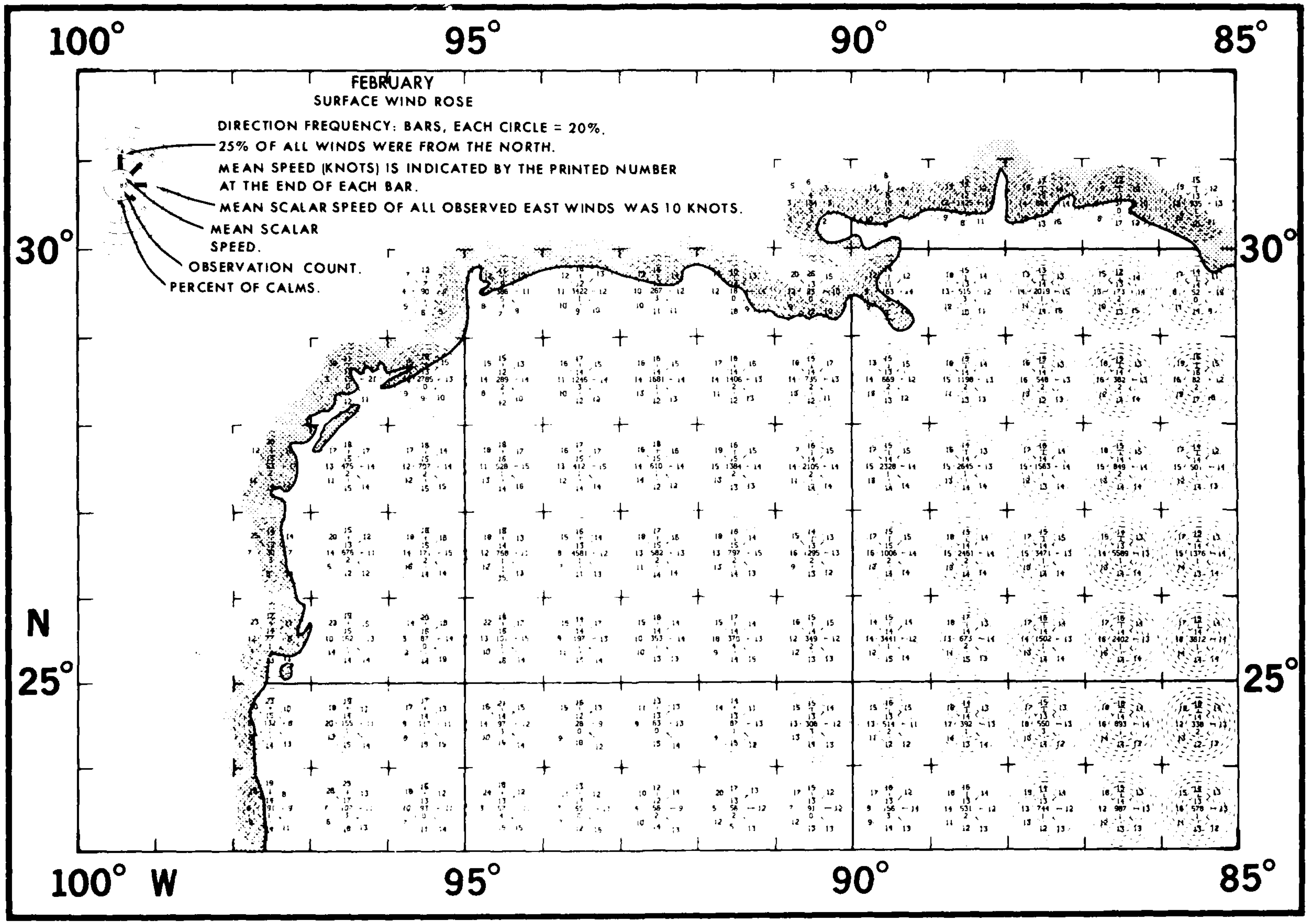

FEBRUARY
CEILING VISIBILITY (LOW RANGE)
PERCENT FREQUENCY OF
SOLID LINE CEILING <300 FEET AND/OR VISIBILITY <1 N. MILE
DASHED LINE CEILING <600 FEET AND/OR VISIBILITY <2 N. MILES
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
<1
<1

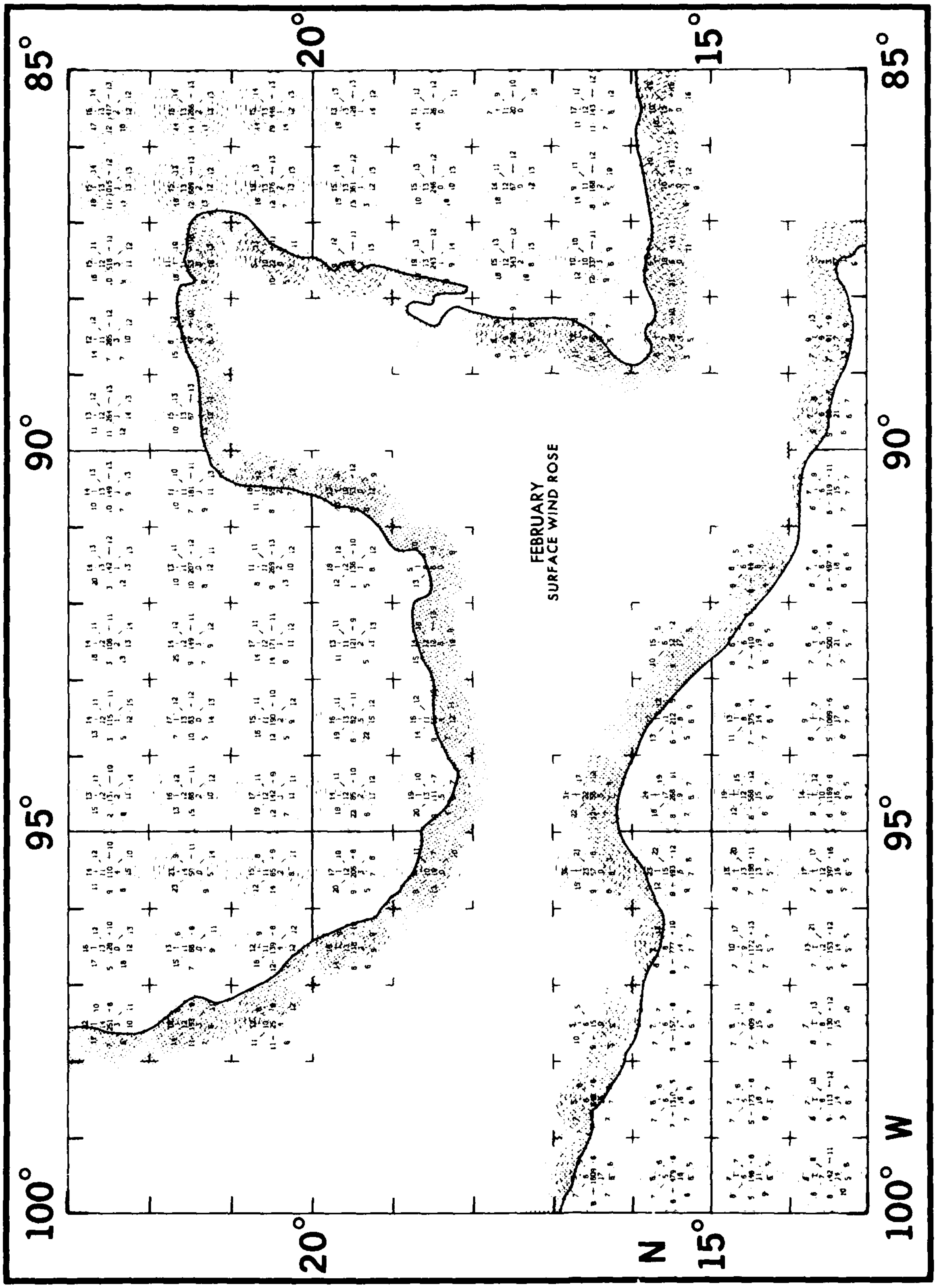

FEBRUARY
WIND-VISIBILITY-CLOUDINESS
SOLID LINE - PERCENT FREQUENCY OF OPTIMUM CONDITIONS: LCC ≥5000 FT., (OR NO LCC), VSBY. ≥5 N. MI. AND WIND 11-21 KTS.
DASHED LINE - PERCENT FREQUENCY OF POOR CONDITIONS. ANY ONE OF THE FOLLOWING CONSTITUTES POOR CONDITIONS: LCC <300 FT., VSBY. <1 N. MI., WIND <6 OR ≥34 KTS.
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W

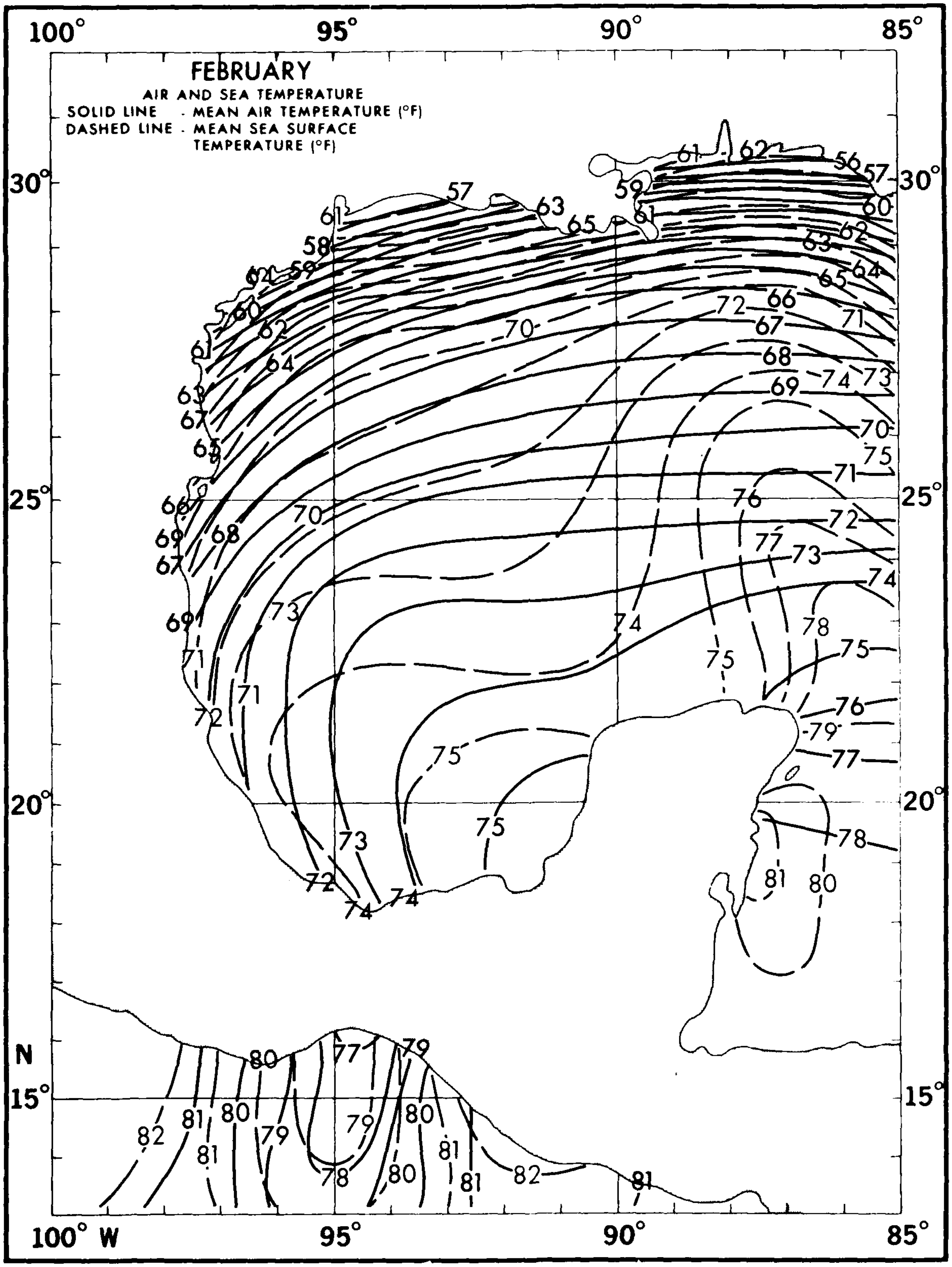

FEBRUARY
WIND SPEED
MEAN SCALAR WIND SPEED (Knots)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
12
13
14
15
11
21
19
17
10
9
8
7
6


FEBRUARY
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED <11 KNOTS
DASHED LINE - WIND SPEED ≥34 KNOTS
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W

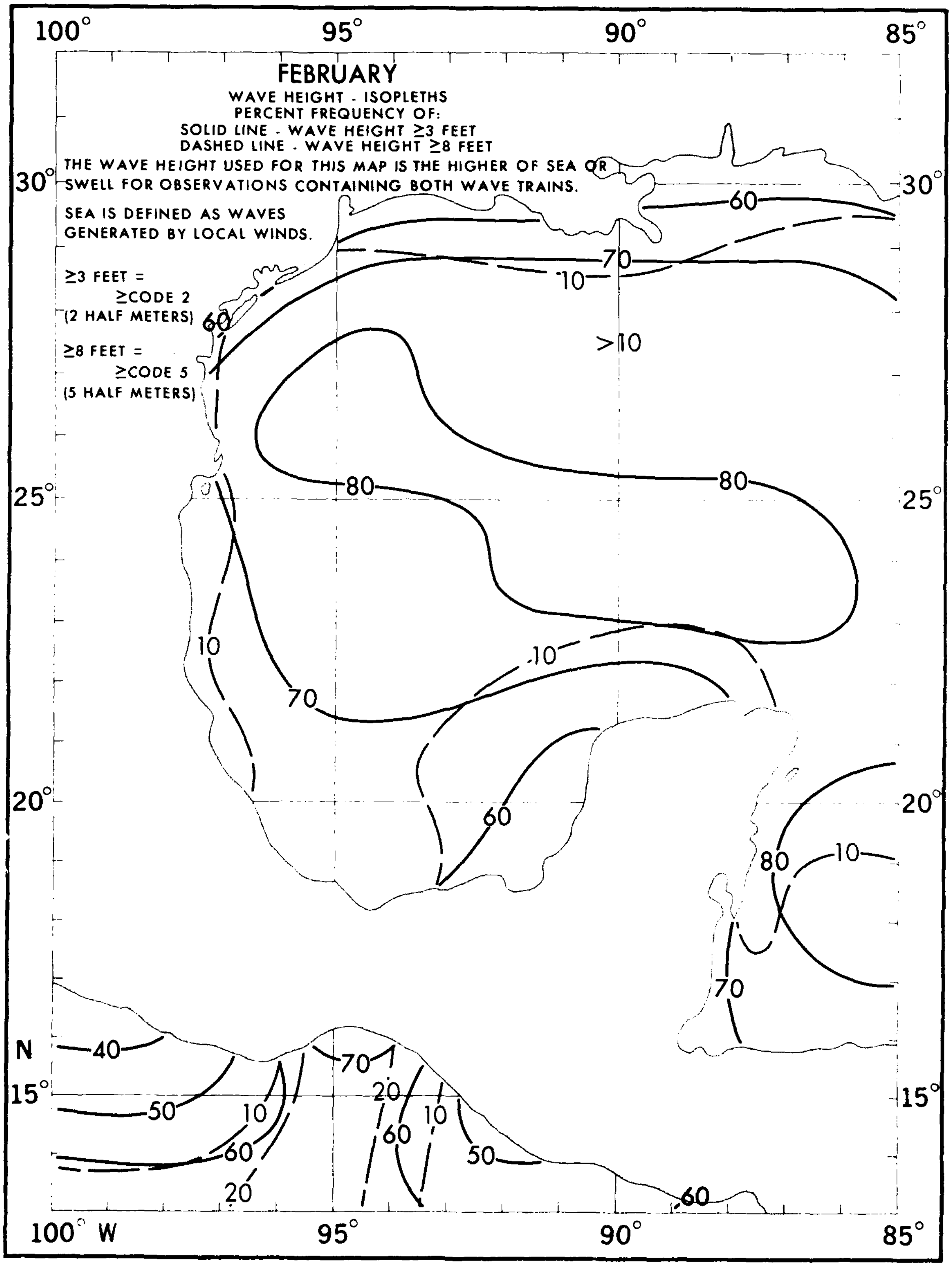

FEBRUARY
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED 11-21 KNOTS
DASHED LINE - WIND SPEED 22-33 KNOTS
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
10
50
40
30
5
25
20
15


FEBRUARY
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM THE NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
100°
95°
90°
85°
30°
25°
N
100° W

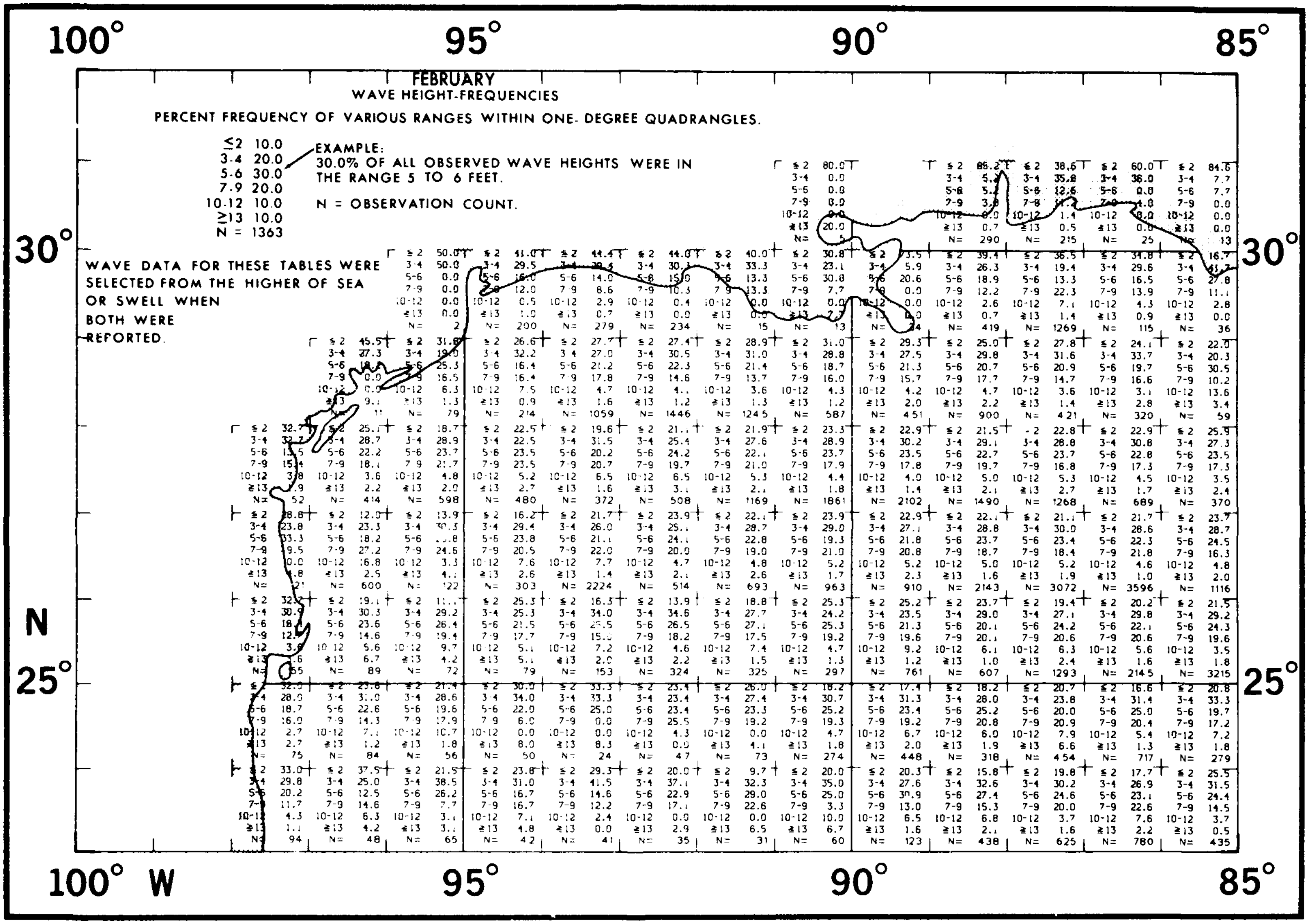

FEBRUARY
SURFACE WIND ROSE
85°
90°
95°
100° W
20°
15°
N

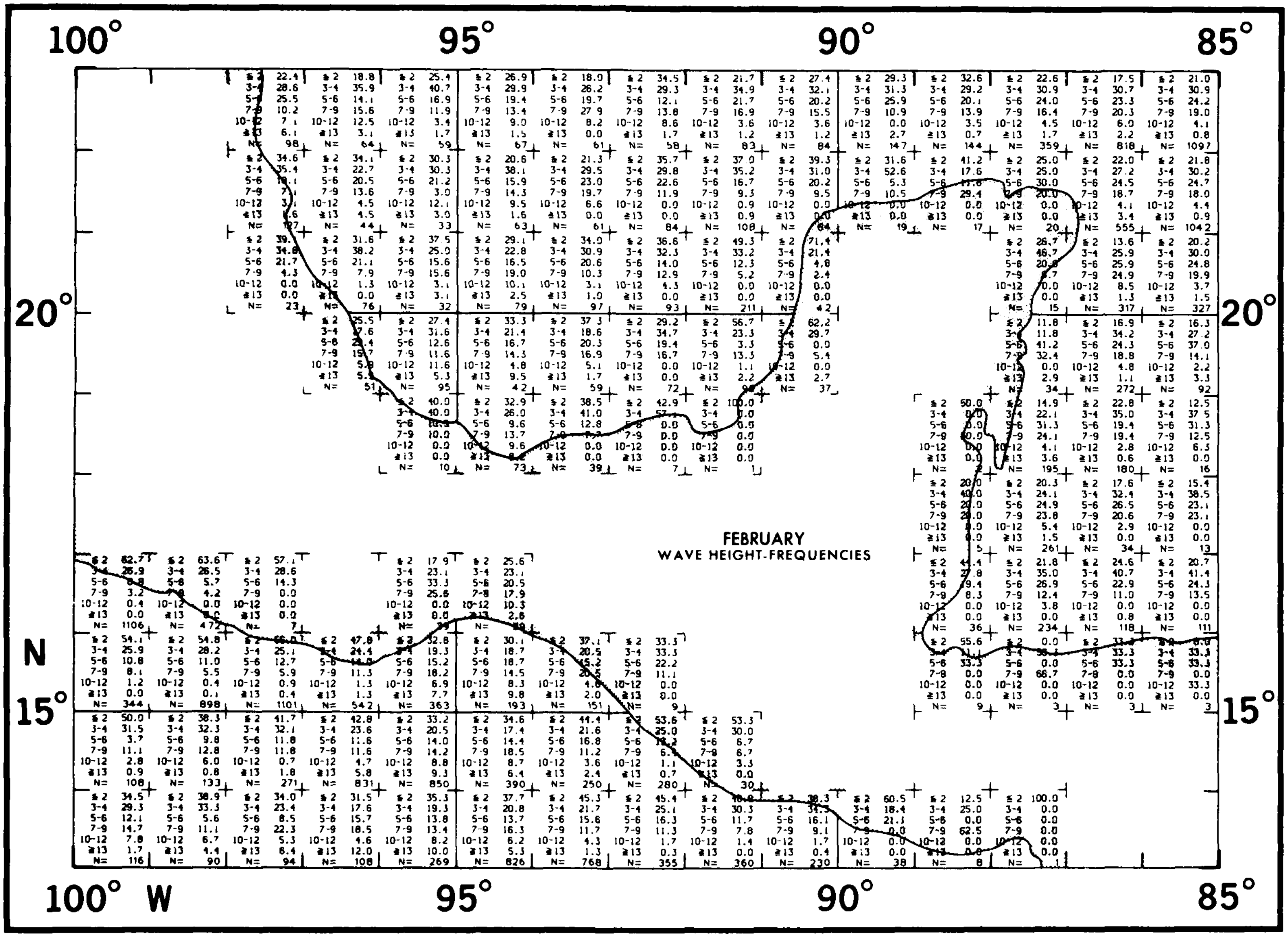


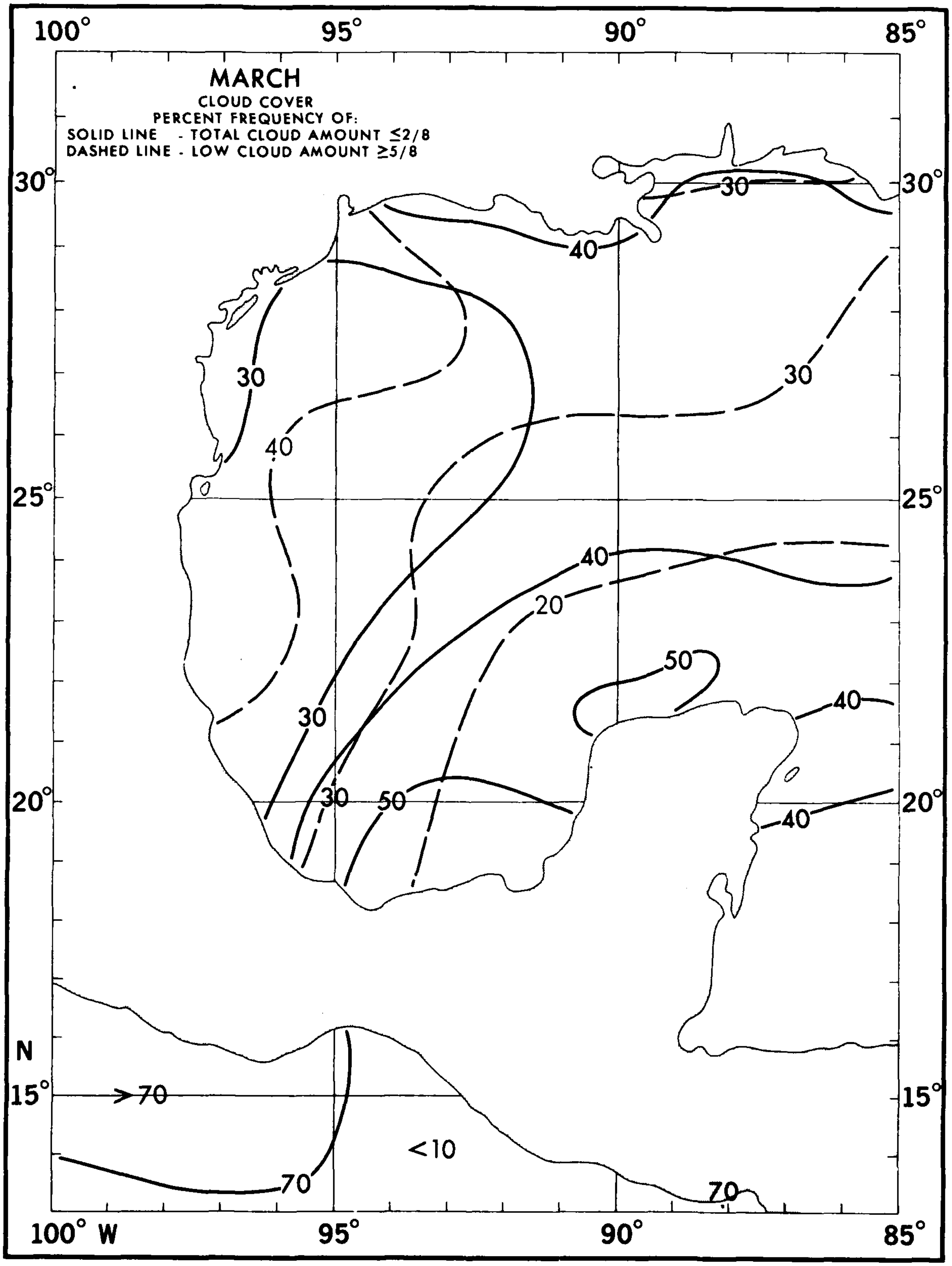
FEBRUARY
AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W

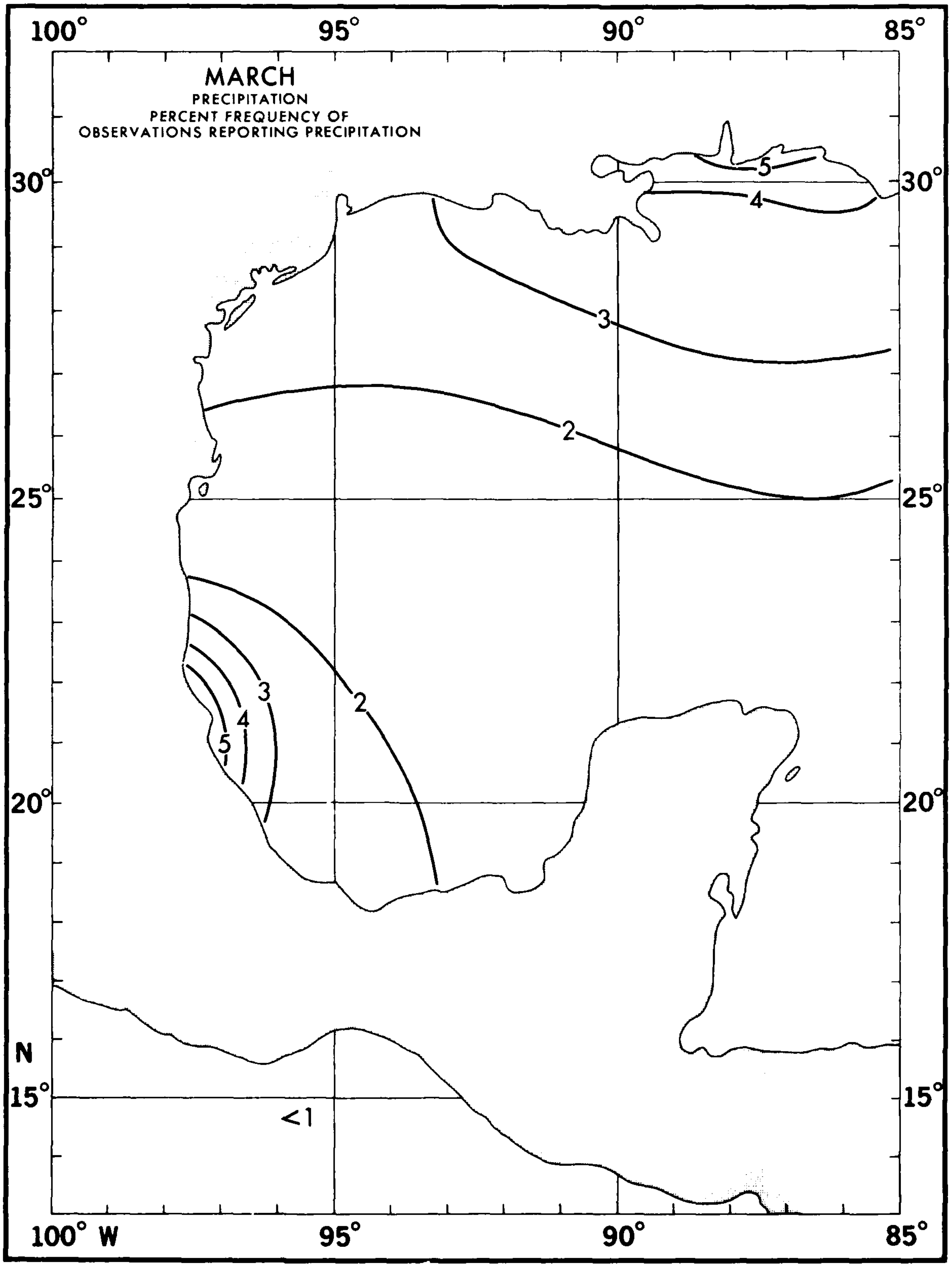


FEBRUARY
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
SOLID LINE - WAVE HEIGHT ≥3 FEET
DASHED LINE - WAVE HEIGHT ≥8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS.
SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
60
70
10
>10
80
60
70
10
40
50
20

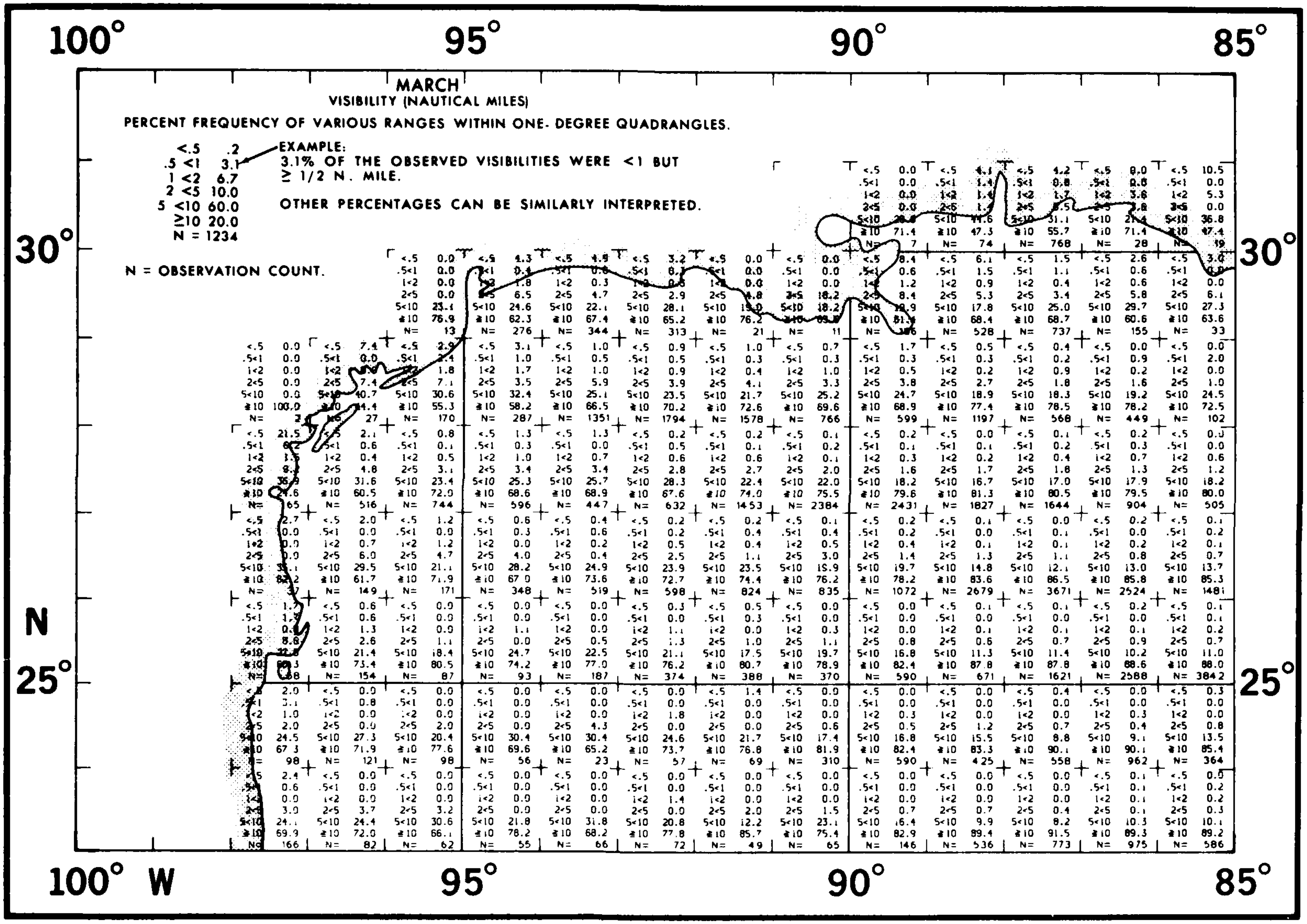

FEBRUARY
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
EXAMPLE:
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
100°
95°
90°
85°
30°
25°
N
100° W

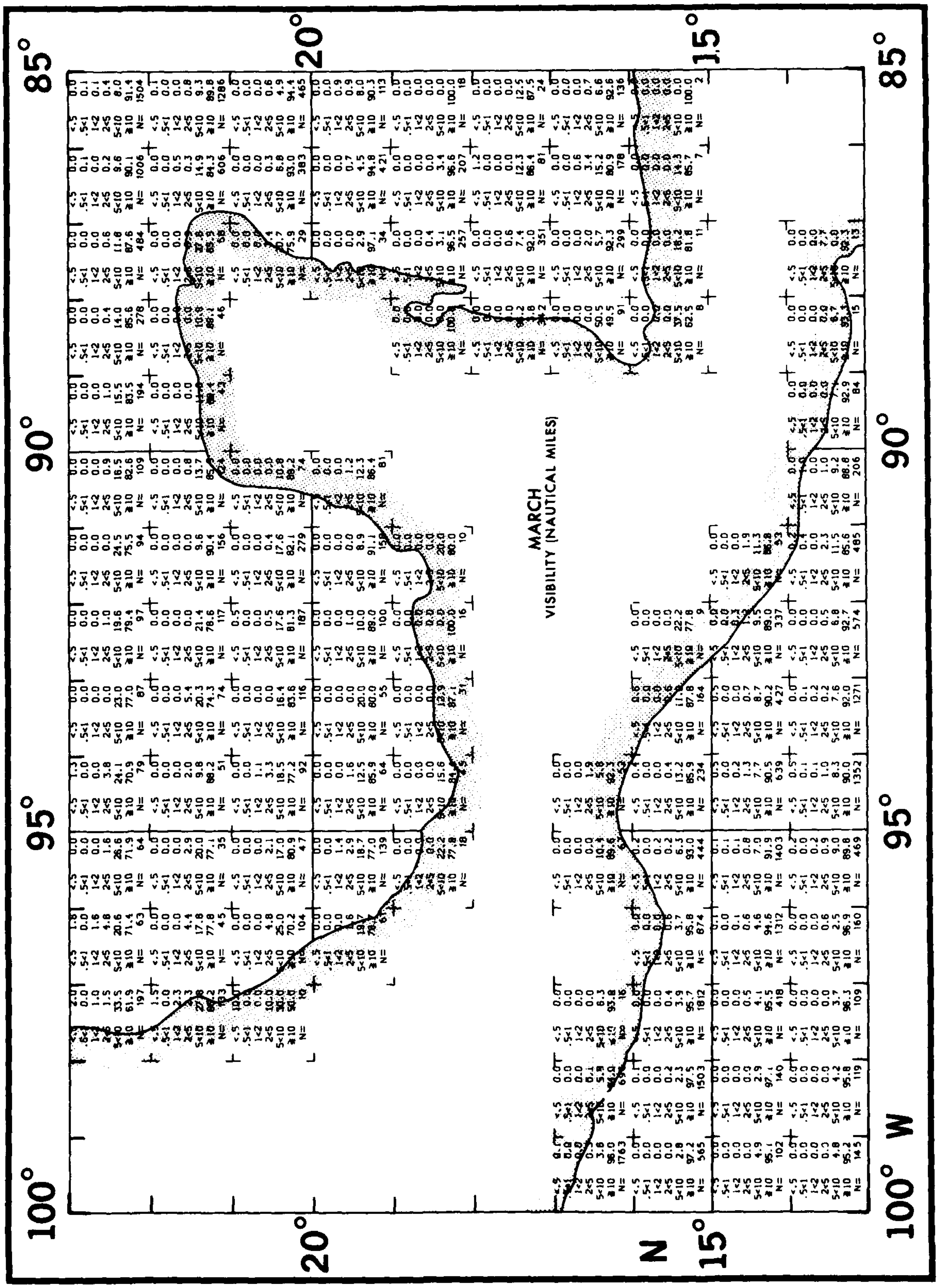

FEBRUARY
WAVE HEIGHT-FREQUENCIES
100°
95°
90°
85°
20°
N
15°
100° W

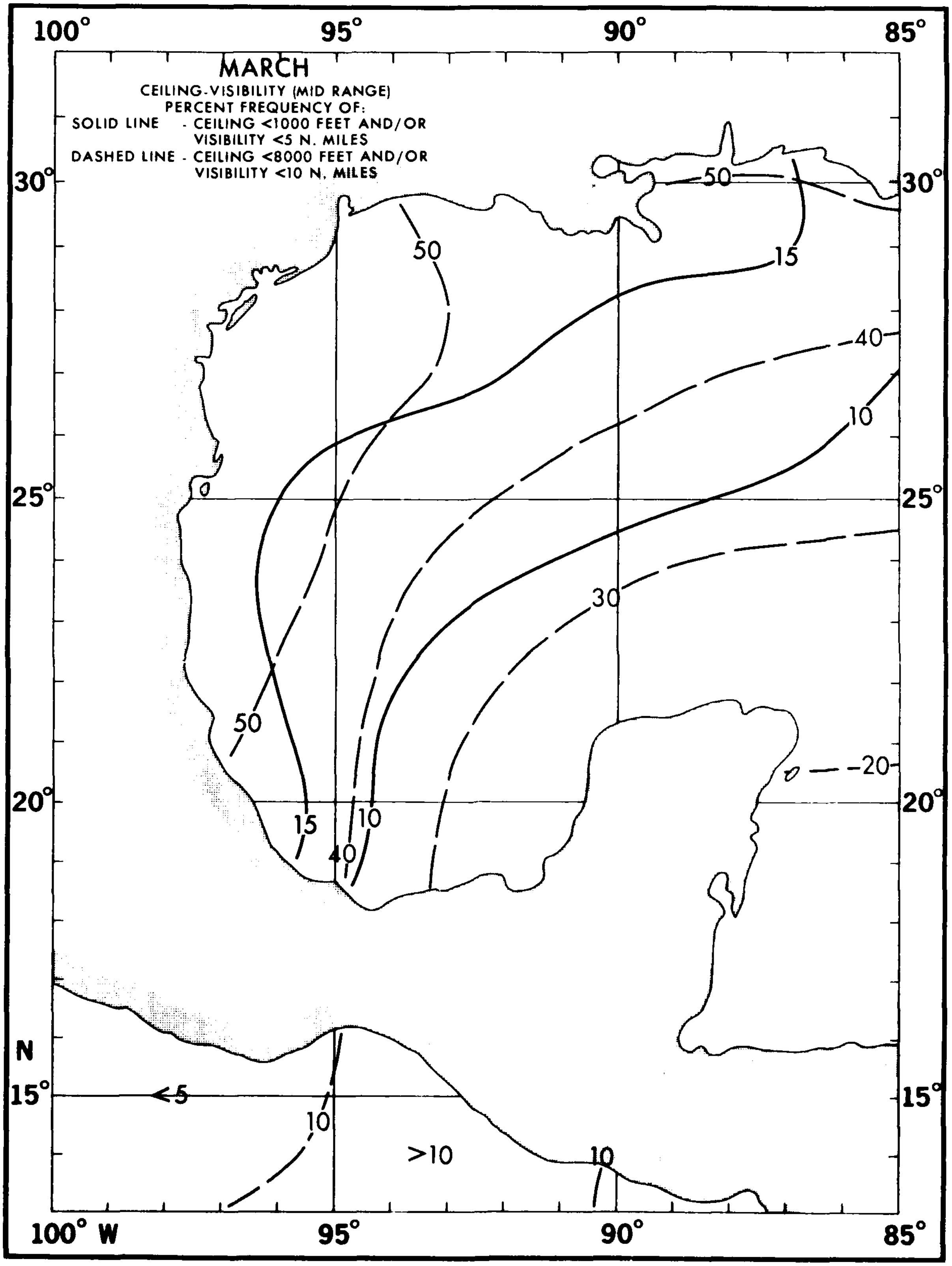

MARCH
CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE - TOTAL CLOUD AMOUNT ≤2/8
DASHED LINE - LOW CLOUD AMOUNT ≥5/8
100°
95°
90°
85°
30°
25°
20°
15°
100° W
N
30
40
50
20
70
<10



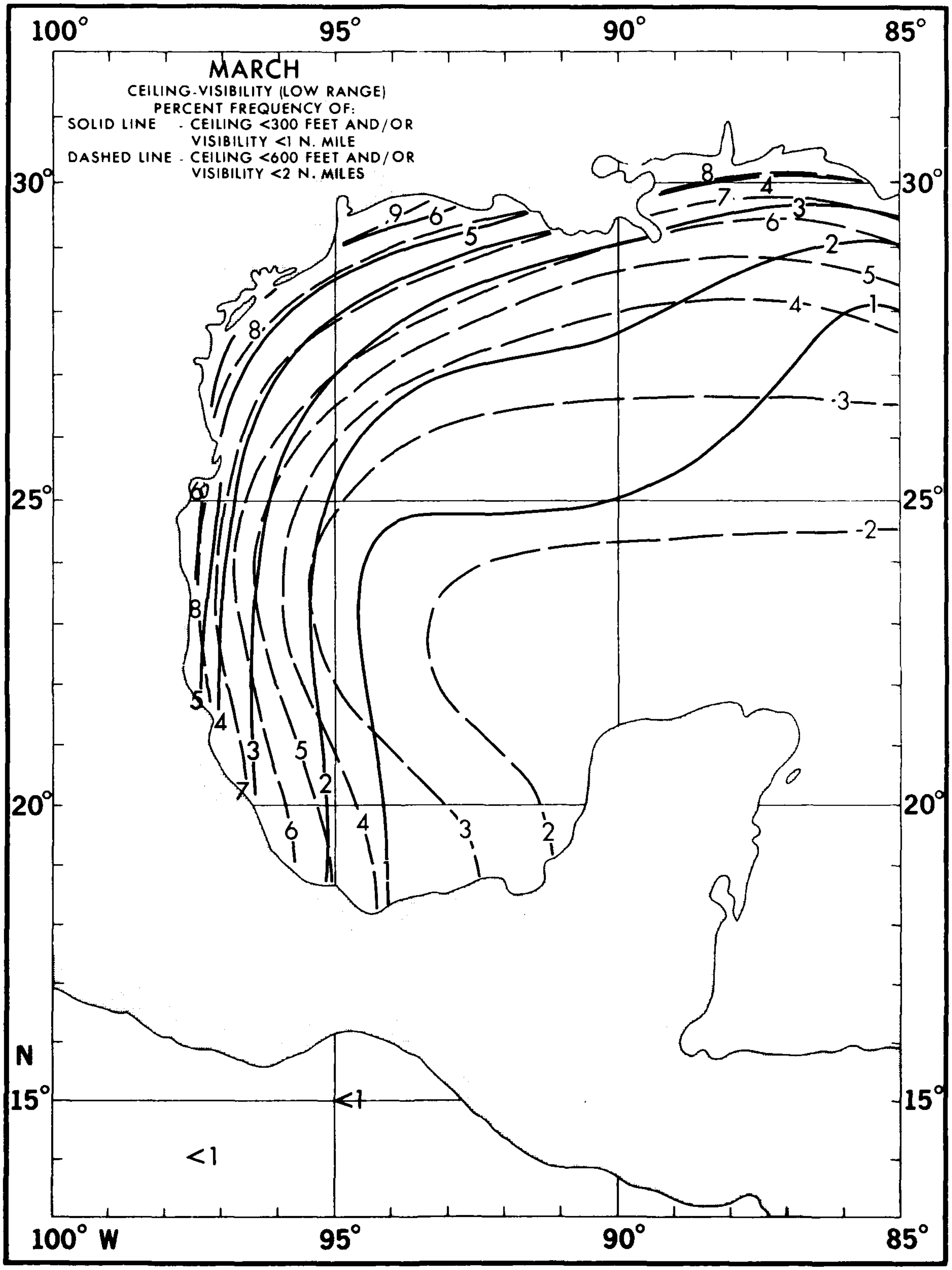
MARCH
PRECIPITATION
PERCENT FREQUENCY OF
OBSERVATIONS REPORTING PRECIPITATION
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
5
4
3
2
3
4
5
2
<1

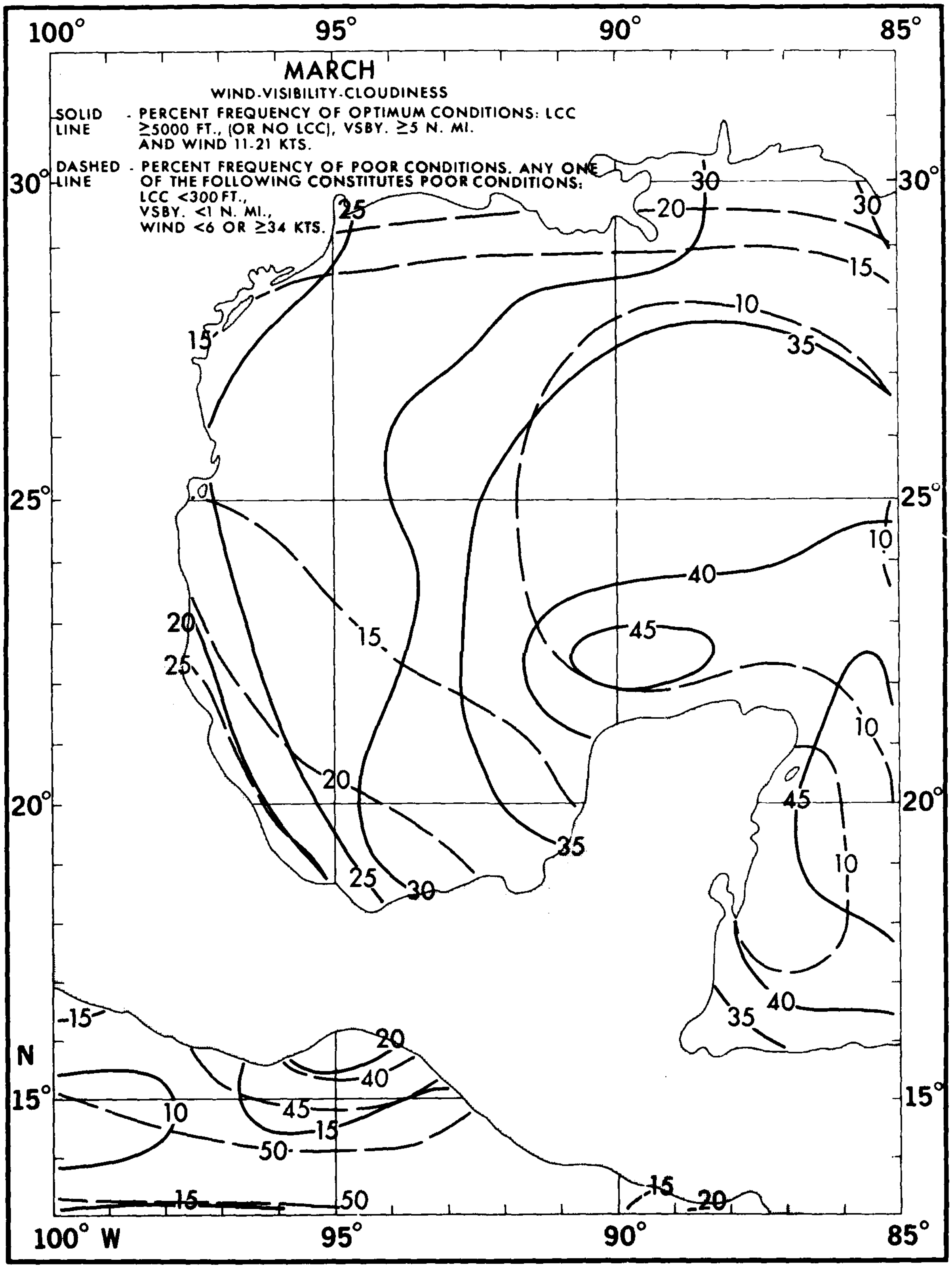

MARCH
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE- DEGREE QUADRANGLES.
<.5 .2
.5 <1 3.1
1 <2 6.7
2 <5 10.0
5 <10 60.0
≥10 20.0
N = 1234
EXAMPLE:
3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥ 1/2 N. MILE.
OTHER PERCENTAGES CAN BE SIMILARLY INTERPRETED.
N = OBSERVATION COUNT.
100°
95°
90°
85°
30°
25°
N
100° W


MARCH
VISIBILITY (NAUTICAL MILES)
100° W
95°
90°
85°
20°
N
15°

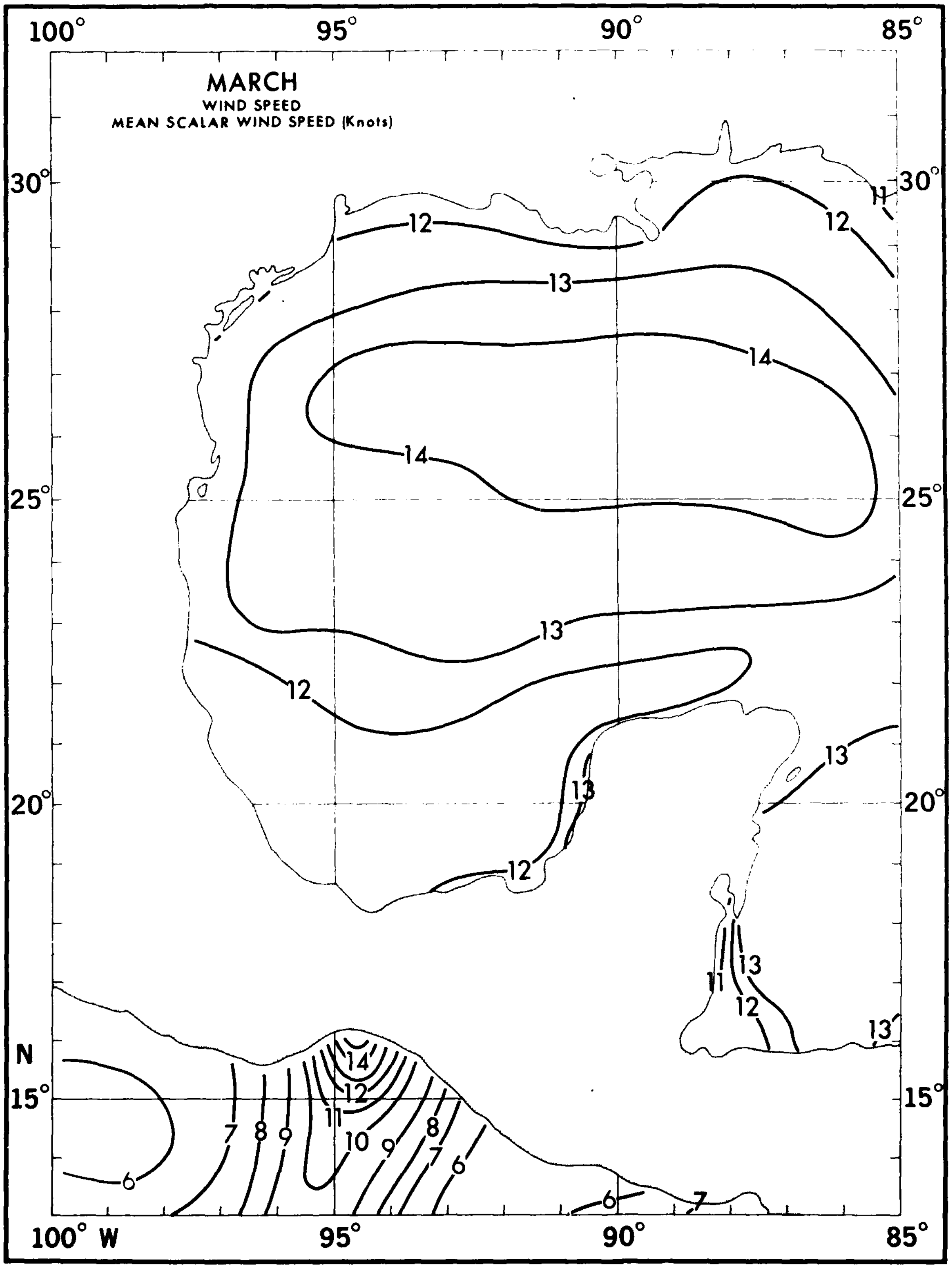


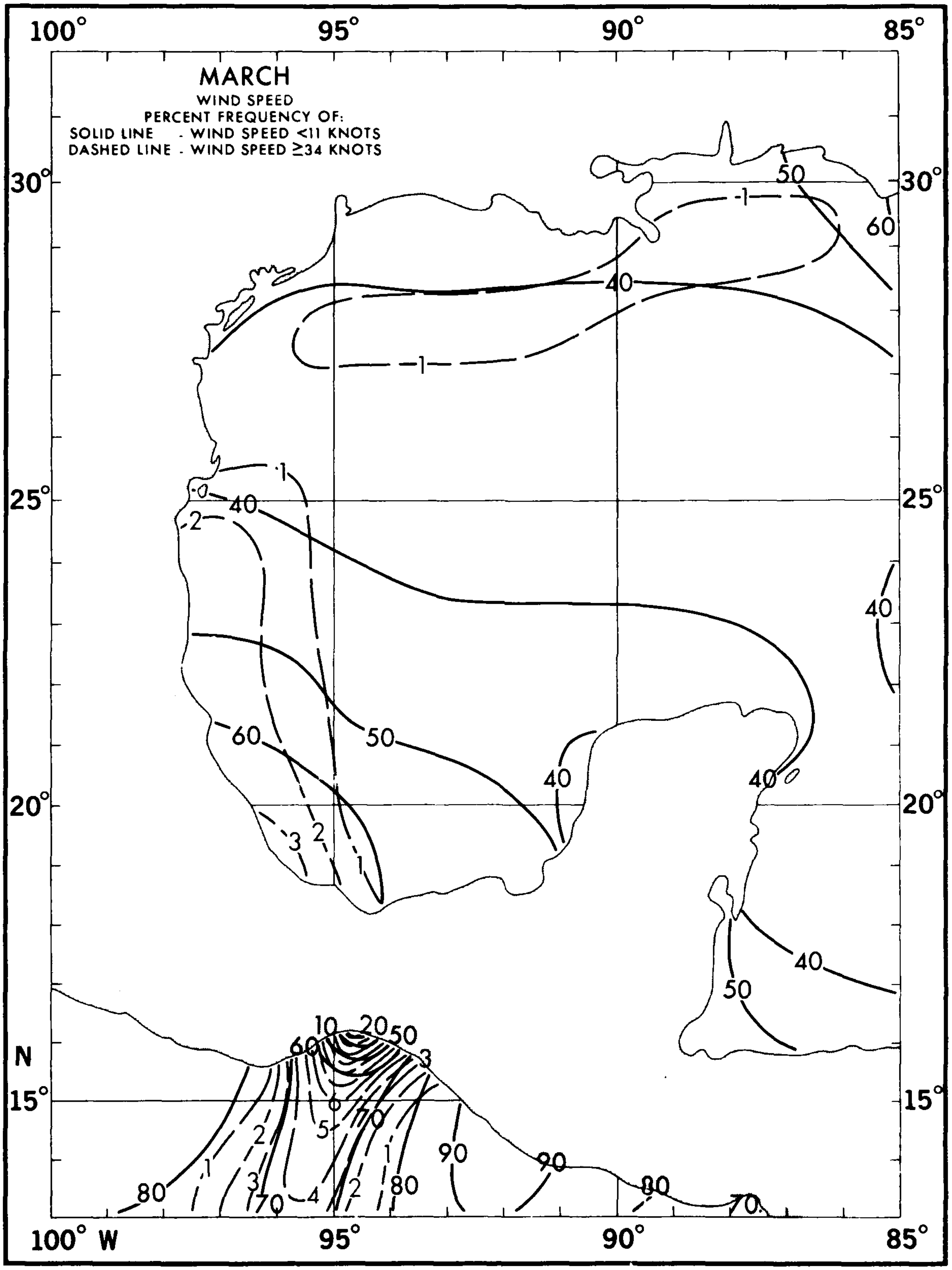
100°
95°
90°
85°
MARCH
CEILING-VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES
DASHED LINE - CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES
30°
25°
20°
15°
N
50
15
40
10
30
20
<5
>10
100° W

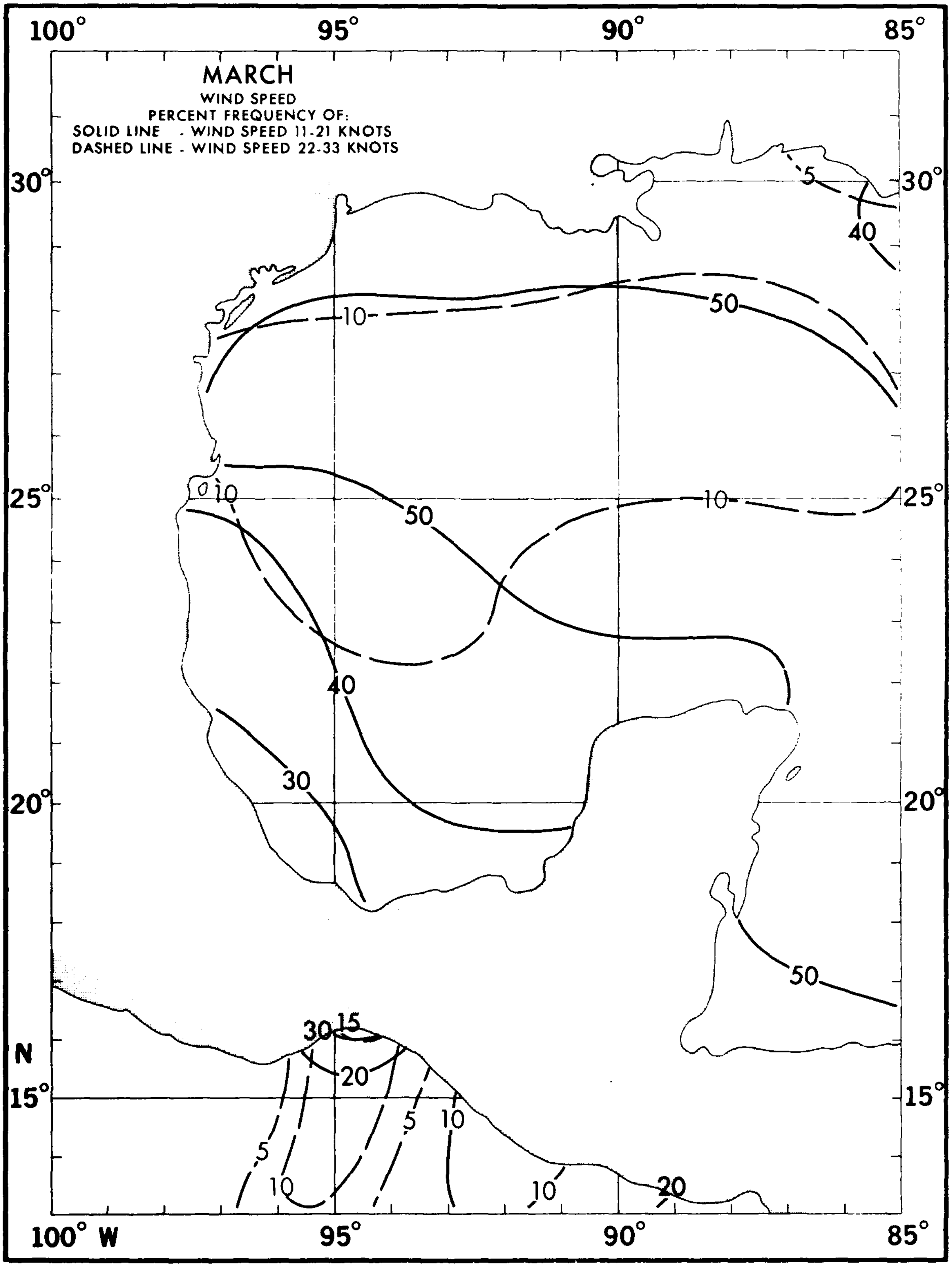

MARCH
CEILING-VISIBILITY (LOW RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <300 FEET AND/OR VISIBILITY <1 N. MILE
DASHED LINE - CEILING <600 FEET AND/OR VISIBILITY <2 N. MILES
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
<1
<1

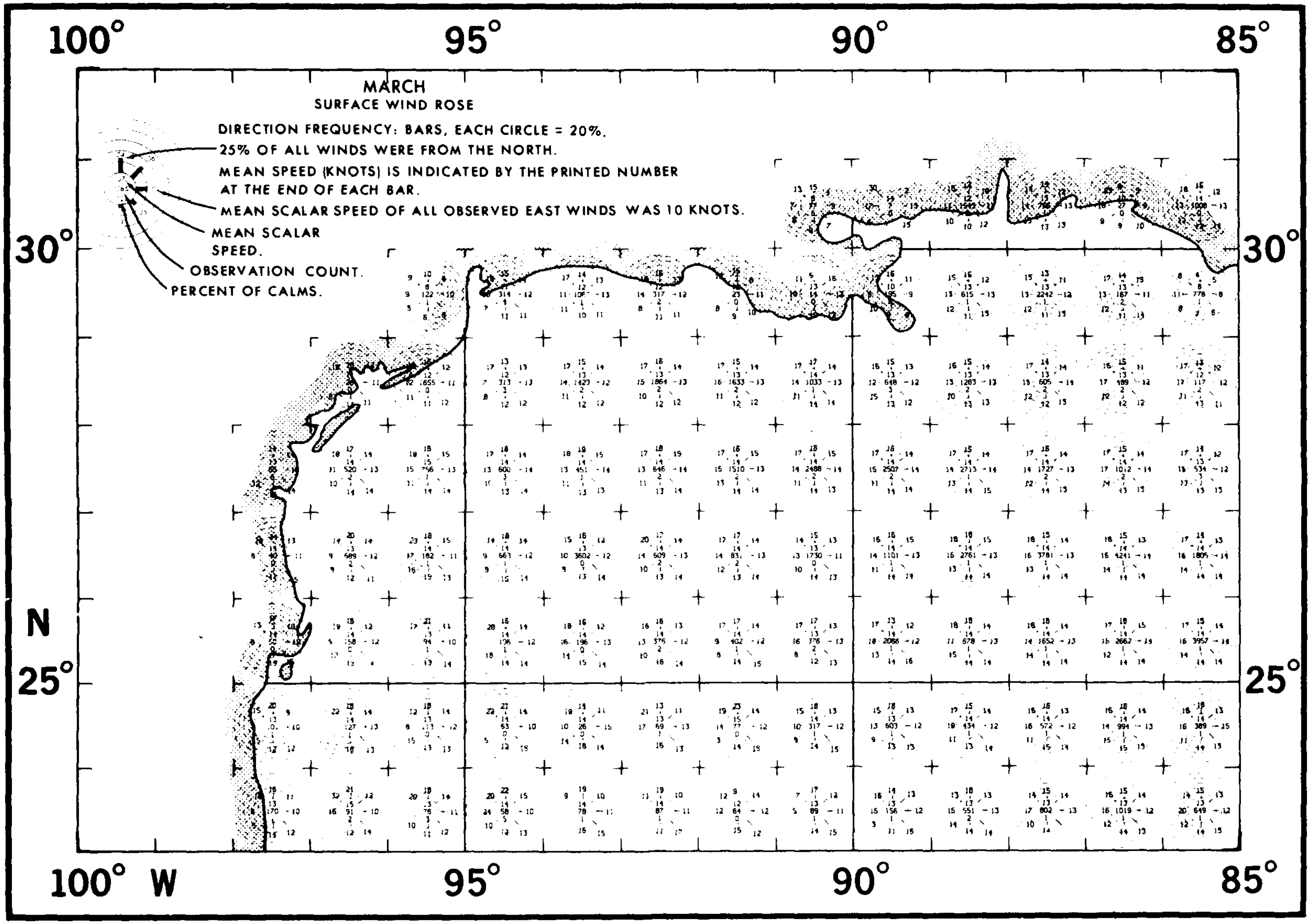


MARCH
WIND-VISIBILITY-CLOUDINESS
SOLID LINE - PERCENT FREQUENCY OF OPTIMUM CONDITIONS: LCC ≥5000 FT., (OR NO LCC), VSBY. ≥5 N. MI. AND WIND 11-21 KTS.
DASHED LINE - PERCENT FREQUENCY OF POOR CONDITIONS. ANY ONE OF THE FOLLOWING CONSTITUTES POOR CONDITIONS: LCC <300 FT., VSBY. <1 N. MI., WIND <6 OR ≥34 KTS.
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W

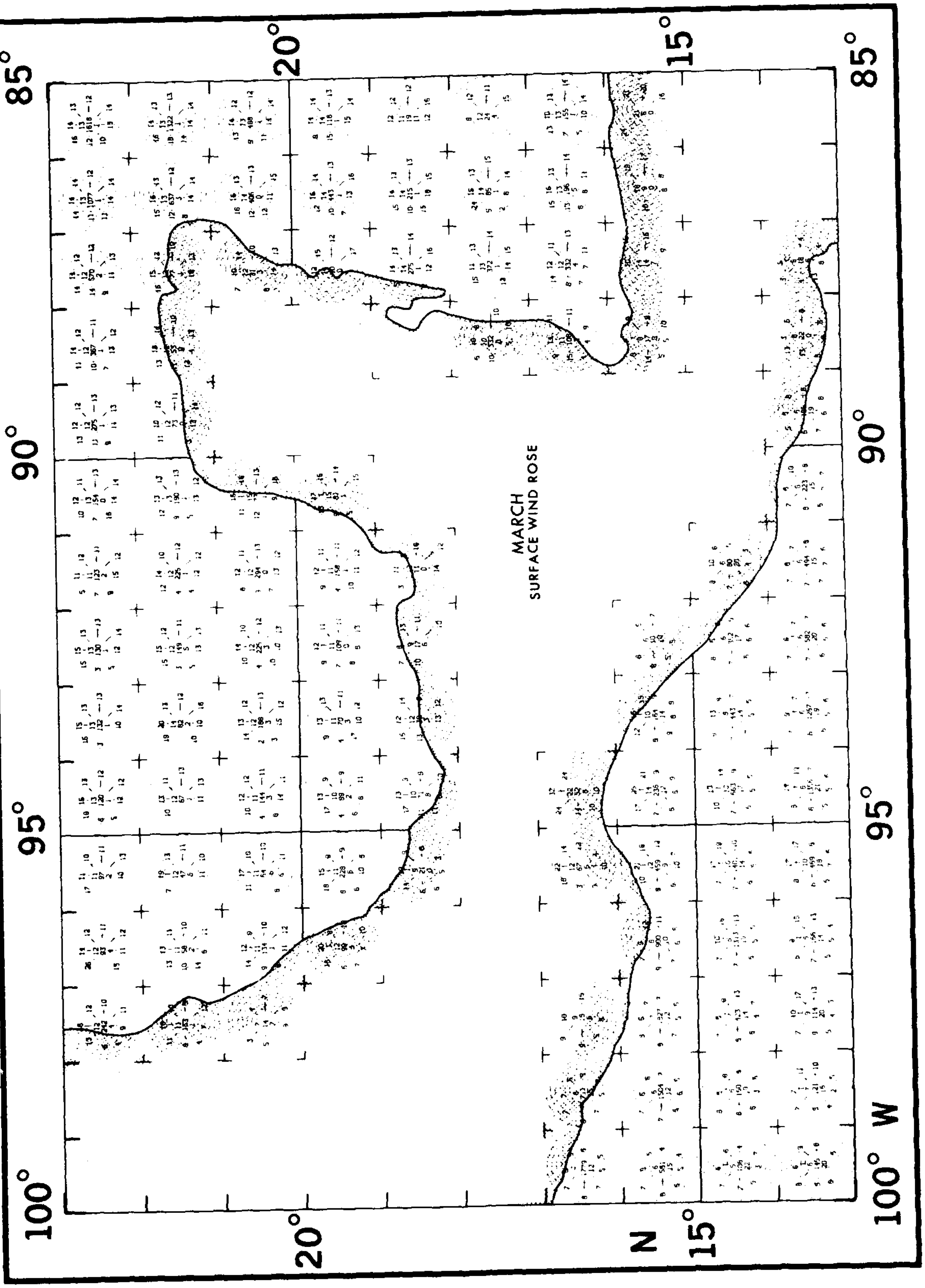

MARCH
WIND SPEED
MEAN SCALAR WIND SPEED (Knots)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
12
13
14
14
13
12
11
12
13
13
12
11
13
12
13
14
12
11
7
8
9
10
9
8
7
6
6
6
7

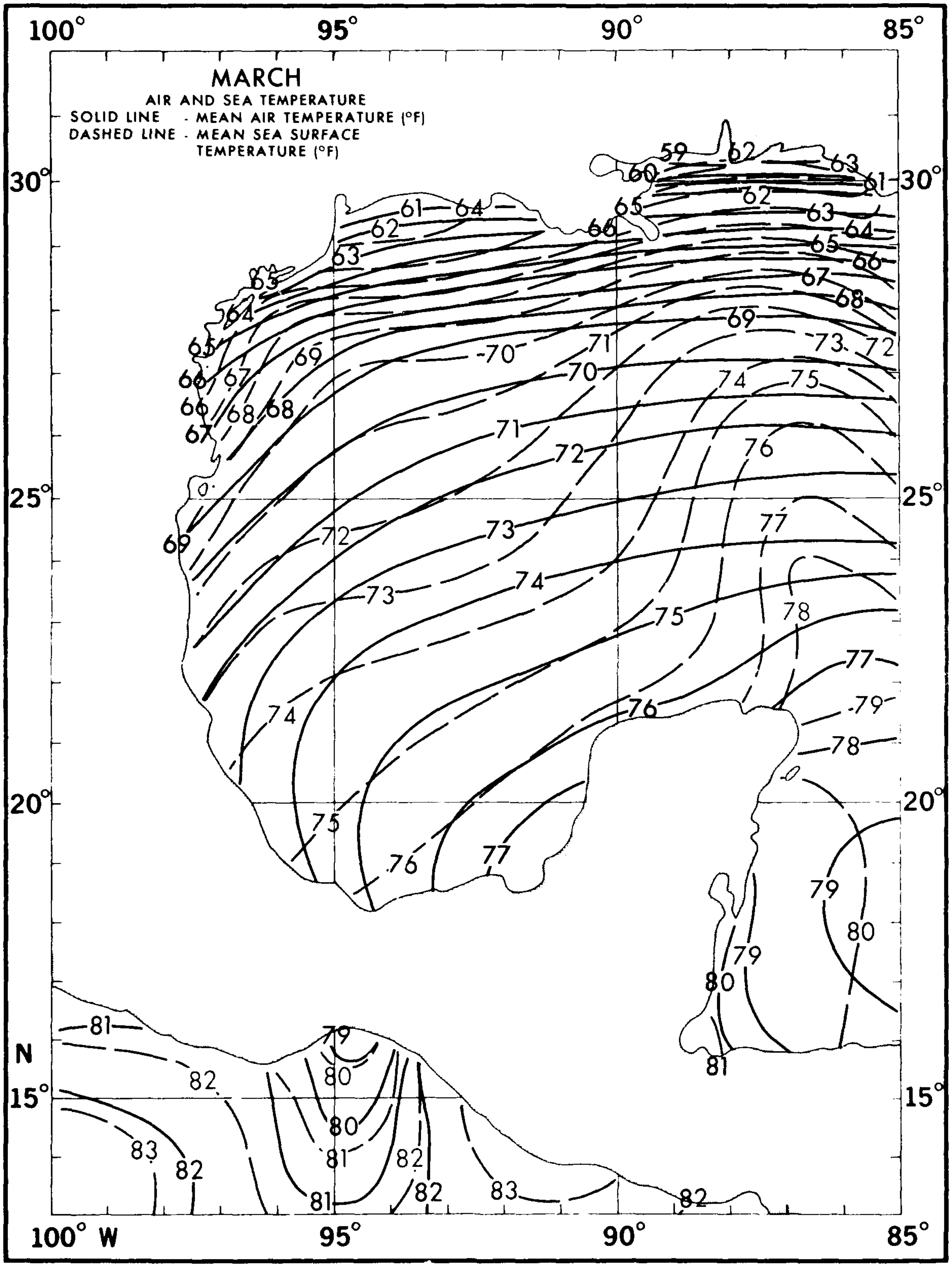

MARCH
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED <11 KNOTS
DASHED LINE - WIND SPEED ≥34 KNOTS
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
40
50
60
1
2
3
70
80
90

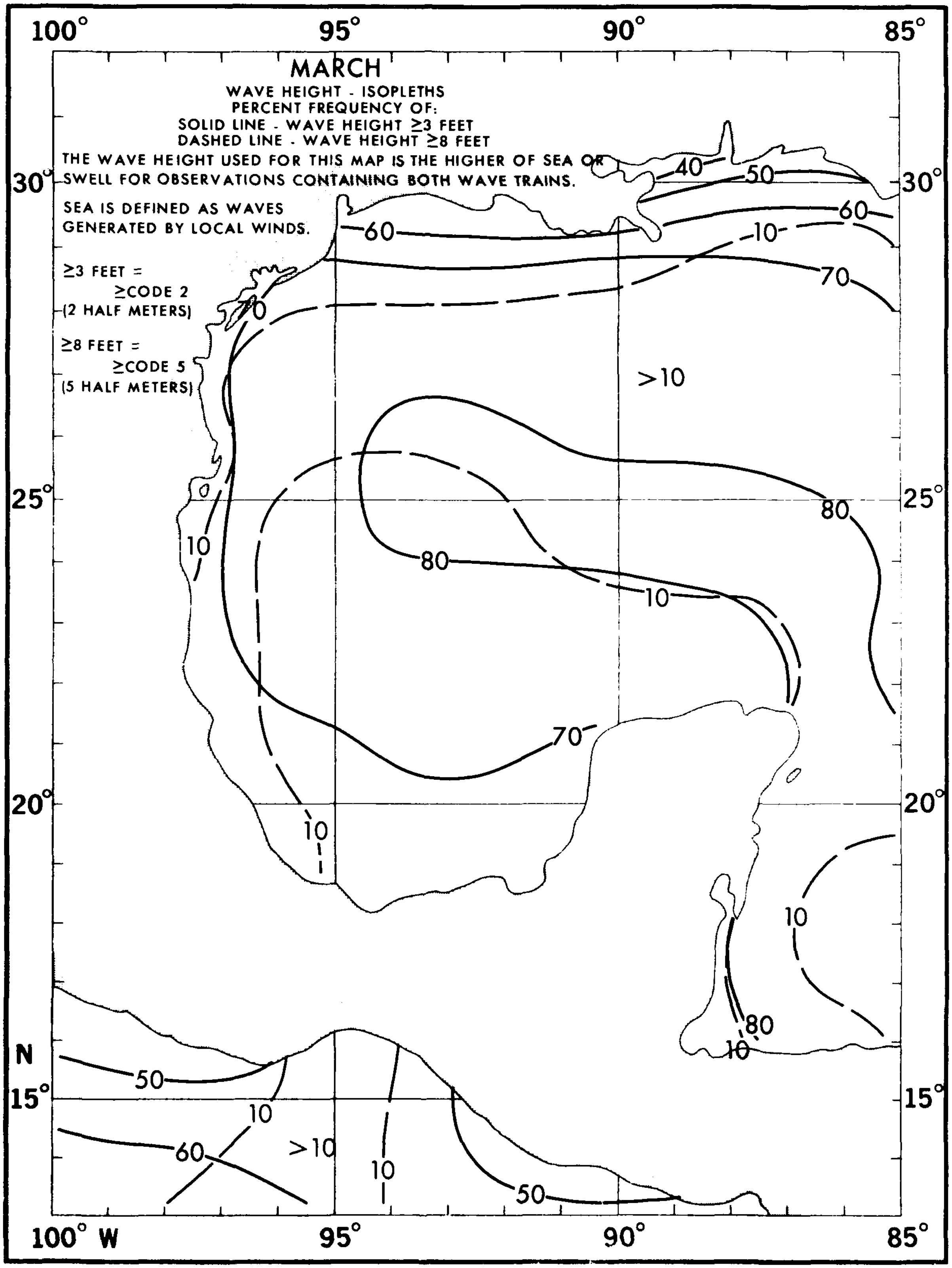

100°
95°
90°
85°
MARCH
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED 11-21 KNOTS
DASHED LINE - WIND SPEED 22-33 KNOTS
30°
25°
20°
N
15°
5
40
10
50
10
50
10
40
30
50
30
15
20
5
10
5
10
10
20
100° W
95°
90°
85°

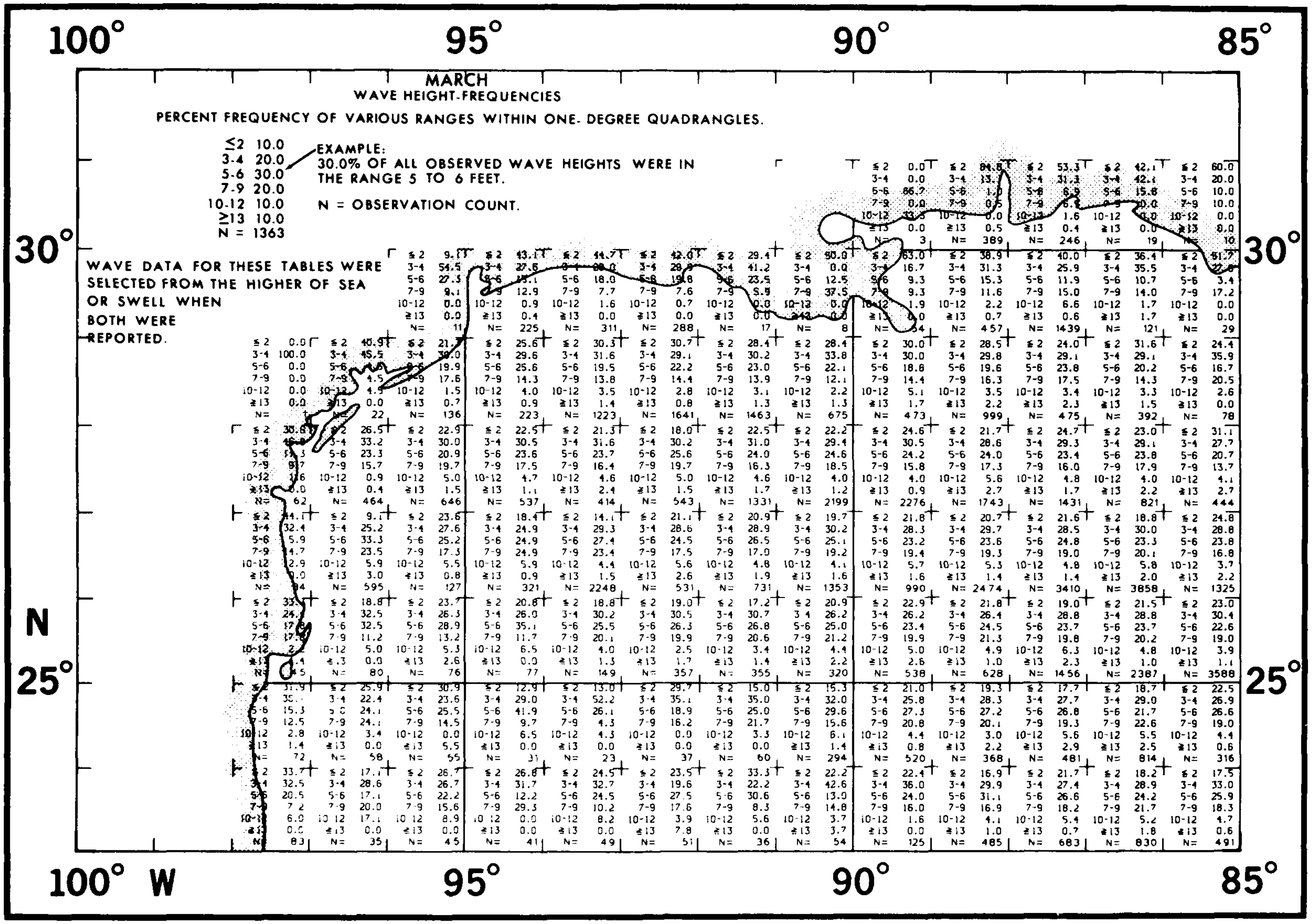


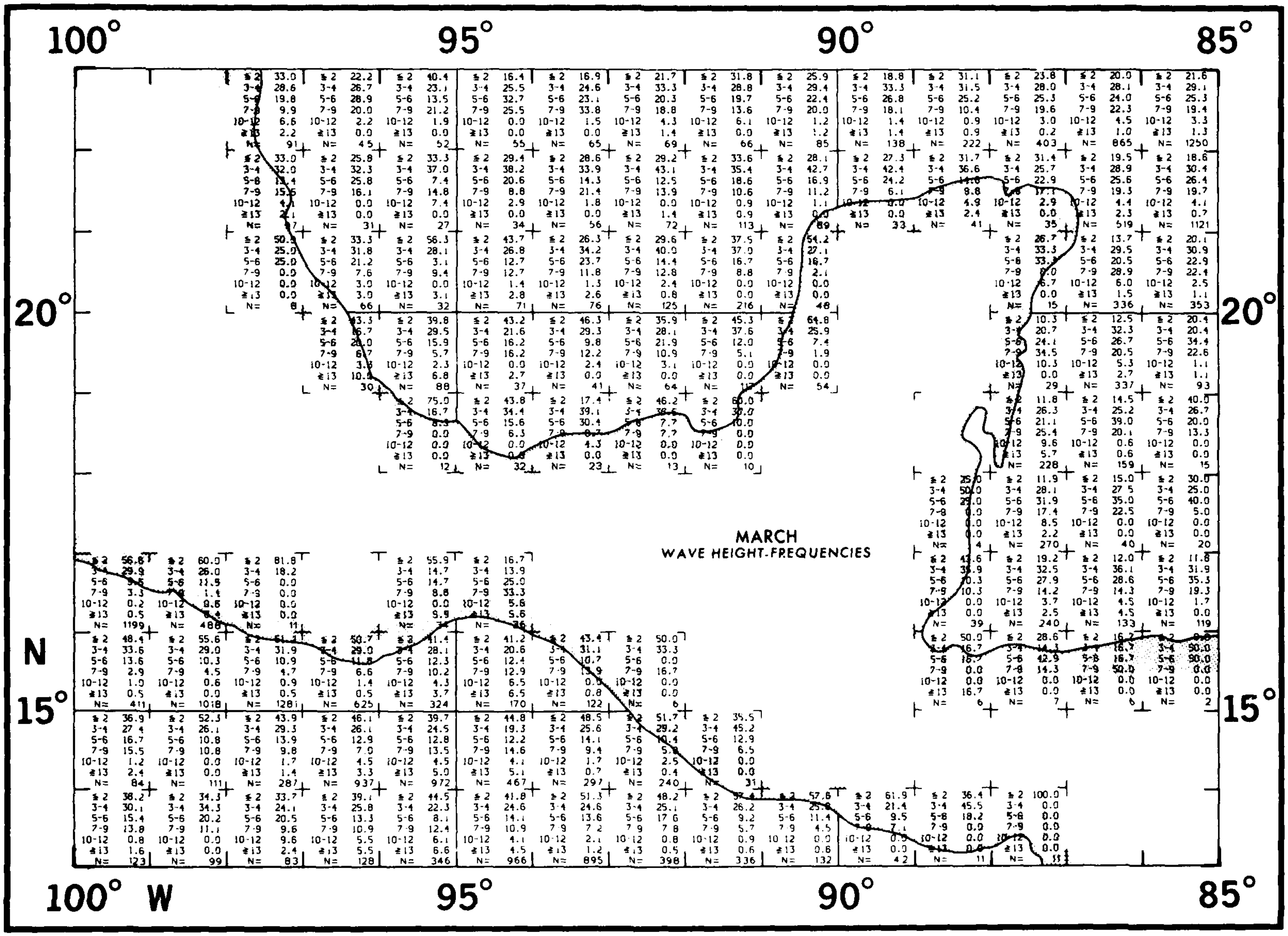
MARCH
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM THE NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
100°
95°
90°
85°
30°
25°
N
100° W

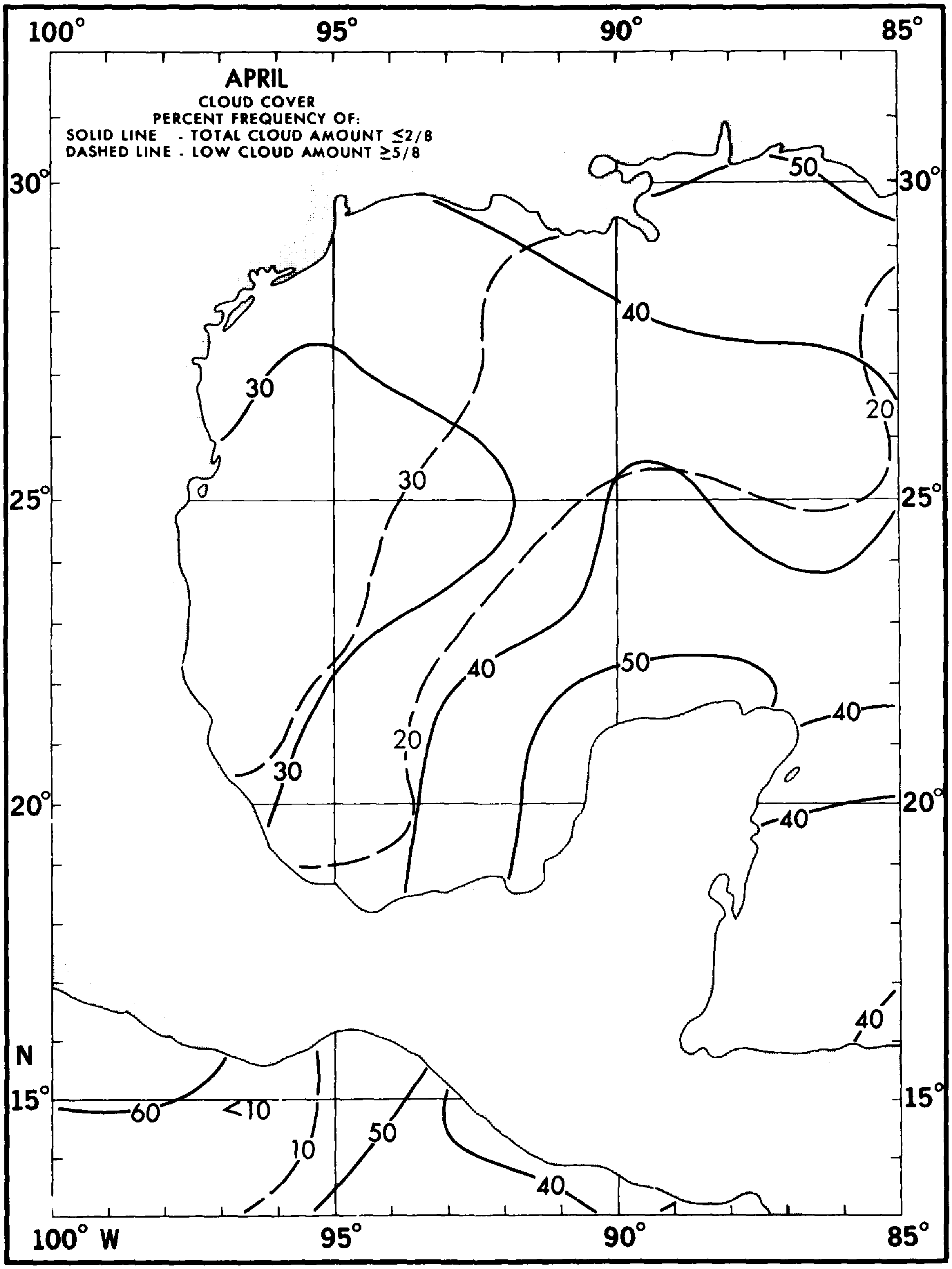

MARCH
SURFACE WIND ROSE
85°
90°
95°
100° W
20°
15°
N


MARCH
AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W

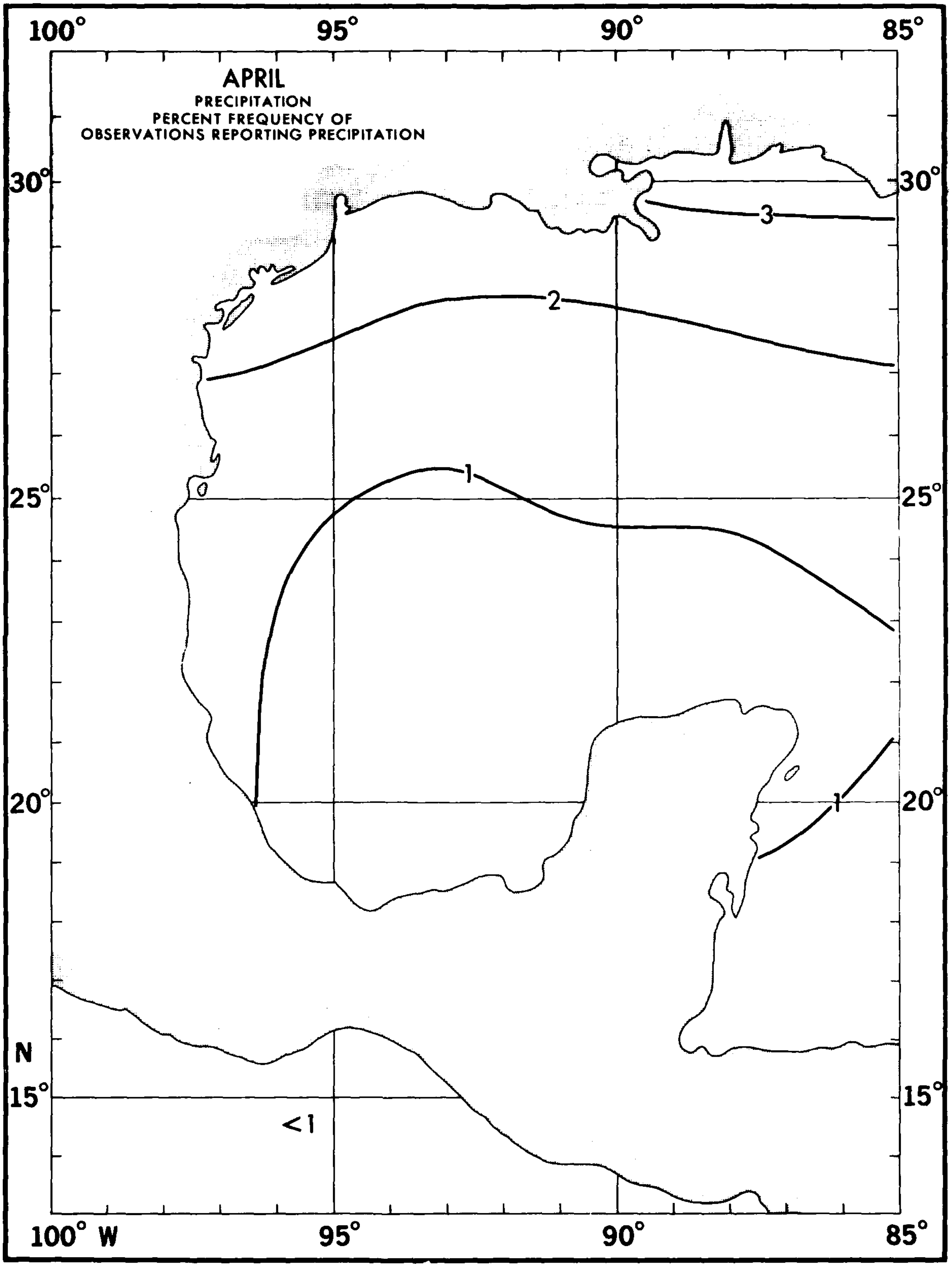

MARCH
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
SOLID LINE - WAVE HEIGHT ≥3 FEET
DASHED LINE - WAVE HEIGHT ≥8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS.
SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
40
50
60
10
70
>10
80

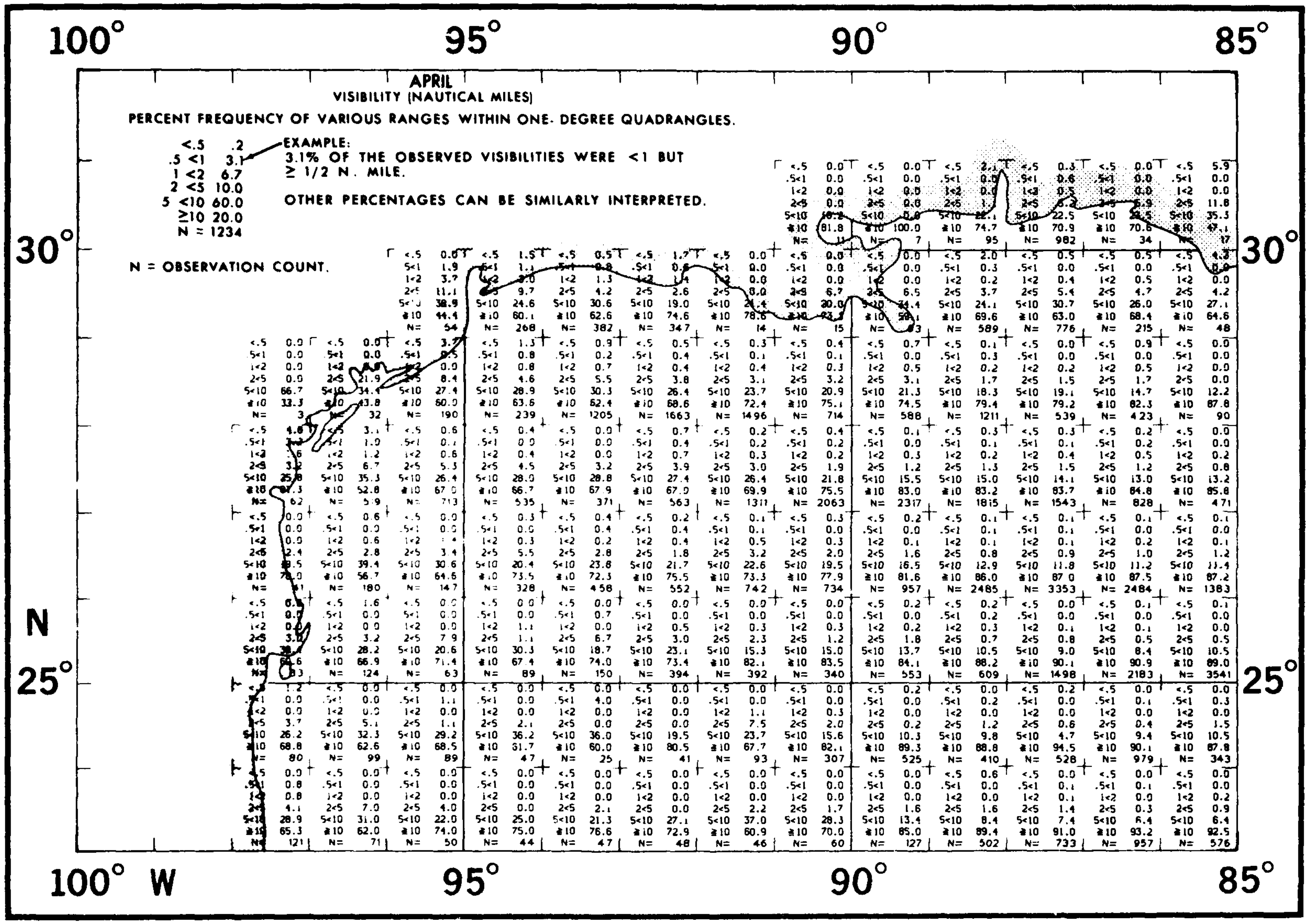

MARCH
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE- DEGREE QUADRANGLES.
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
EXAMPLE:
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
100°
95°
90°
85°
30°
25°
N
100° W

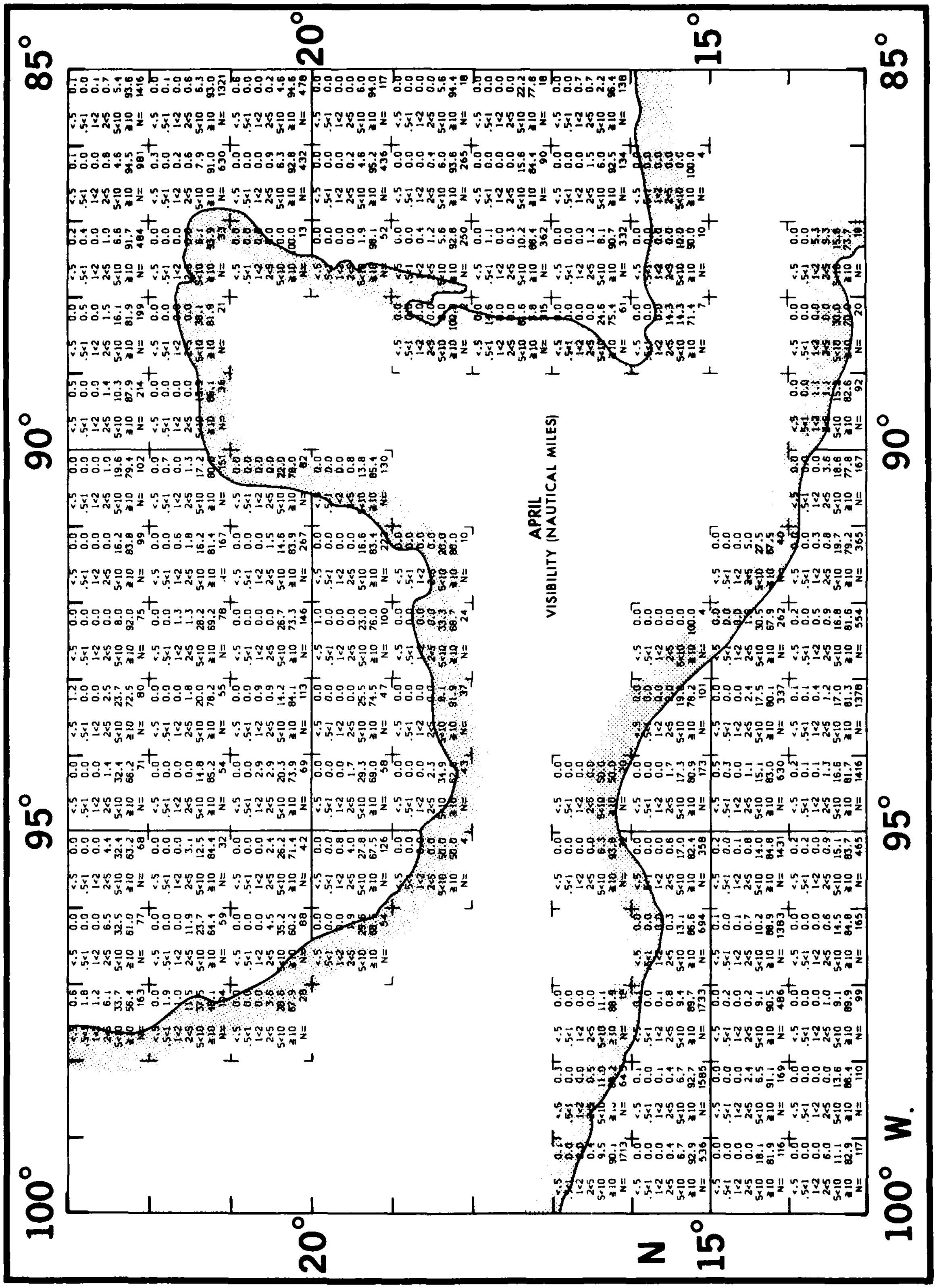

MARCH
WAVE HEIGHT-FREQUENCIES
100°
95°
90°
85°
20°
N
15°
100° W

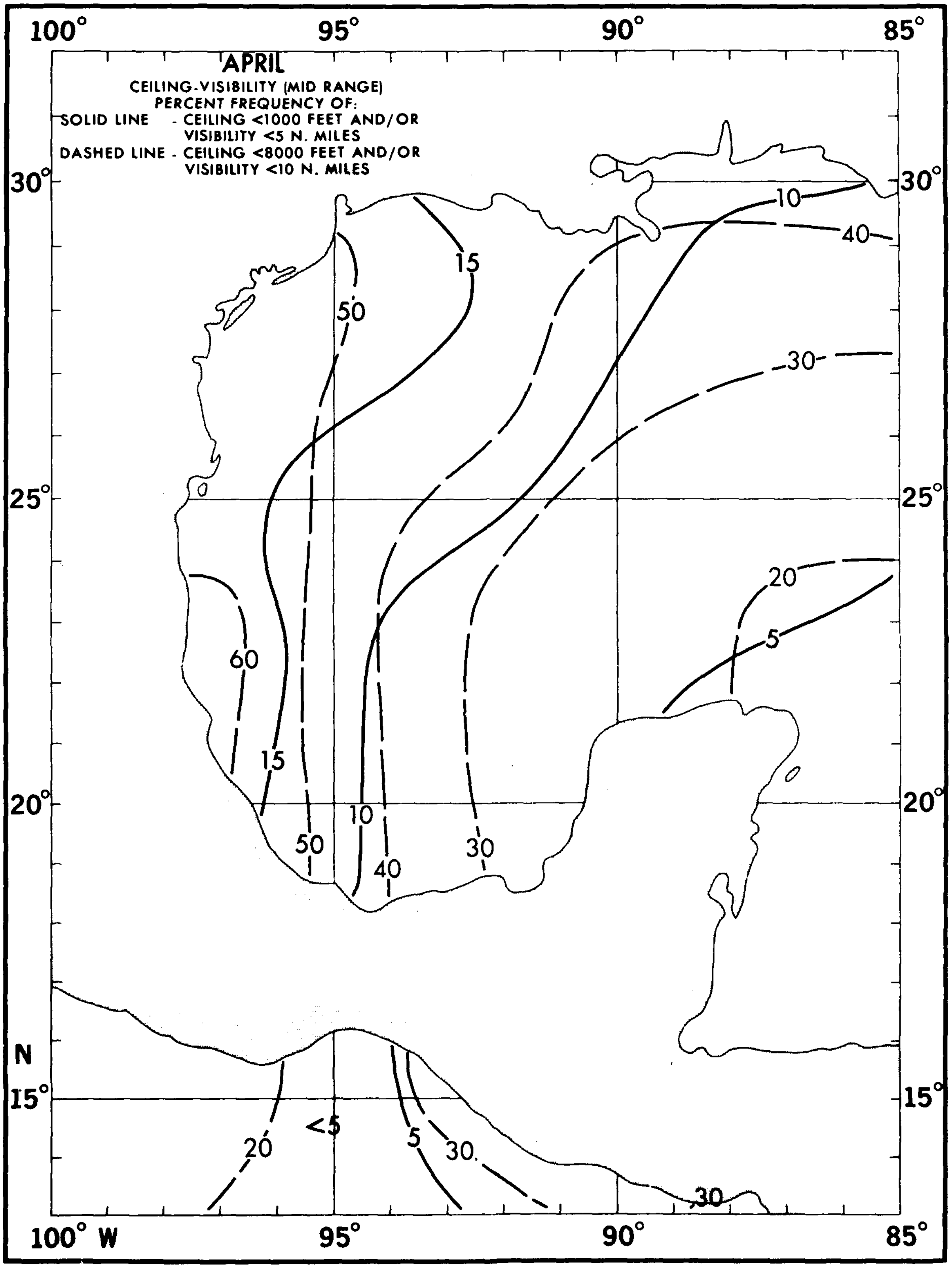


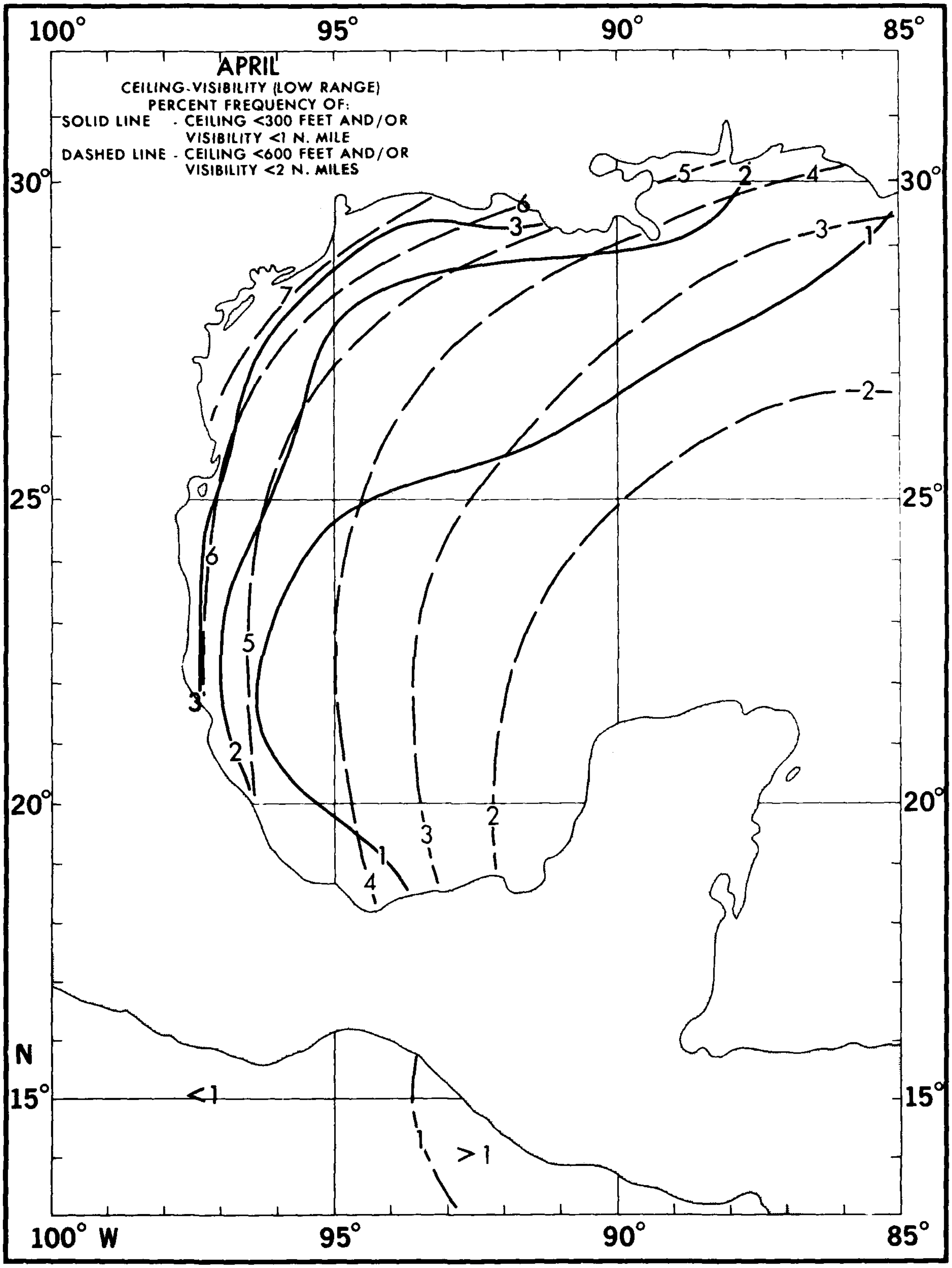
APRIL
CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE - TOTAL CLOUD AMOUNT ≤2/8
DASHED LINE - LOW CLOUD AMOUNT ≥5/8
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
50
40
30
20
30
40
50
40
20
30
40
40
60
<10
10
50
40

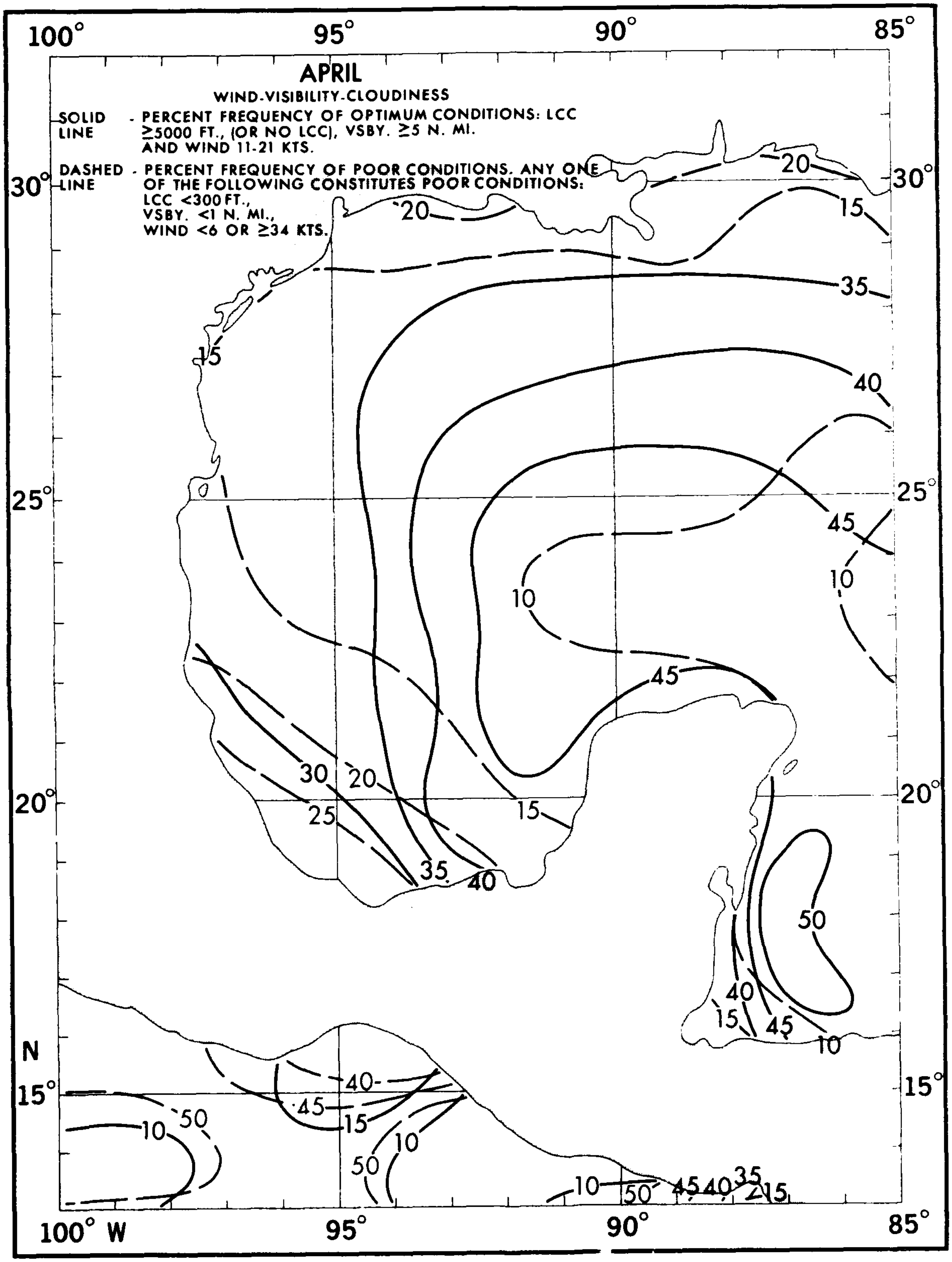

APRIL
PRECIPITATION
PERCENT FREQUENCY OF
OBSERVATIONS REPORTING PRECIPITATION
100°
95°
90°
85°
30°
25°
20°
15°
N
3
2
1
1
<1
100° W
95°
90°
85°

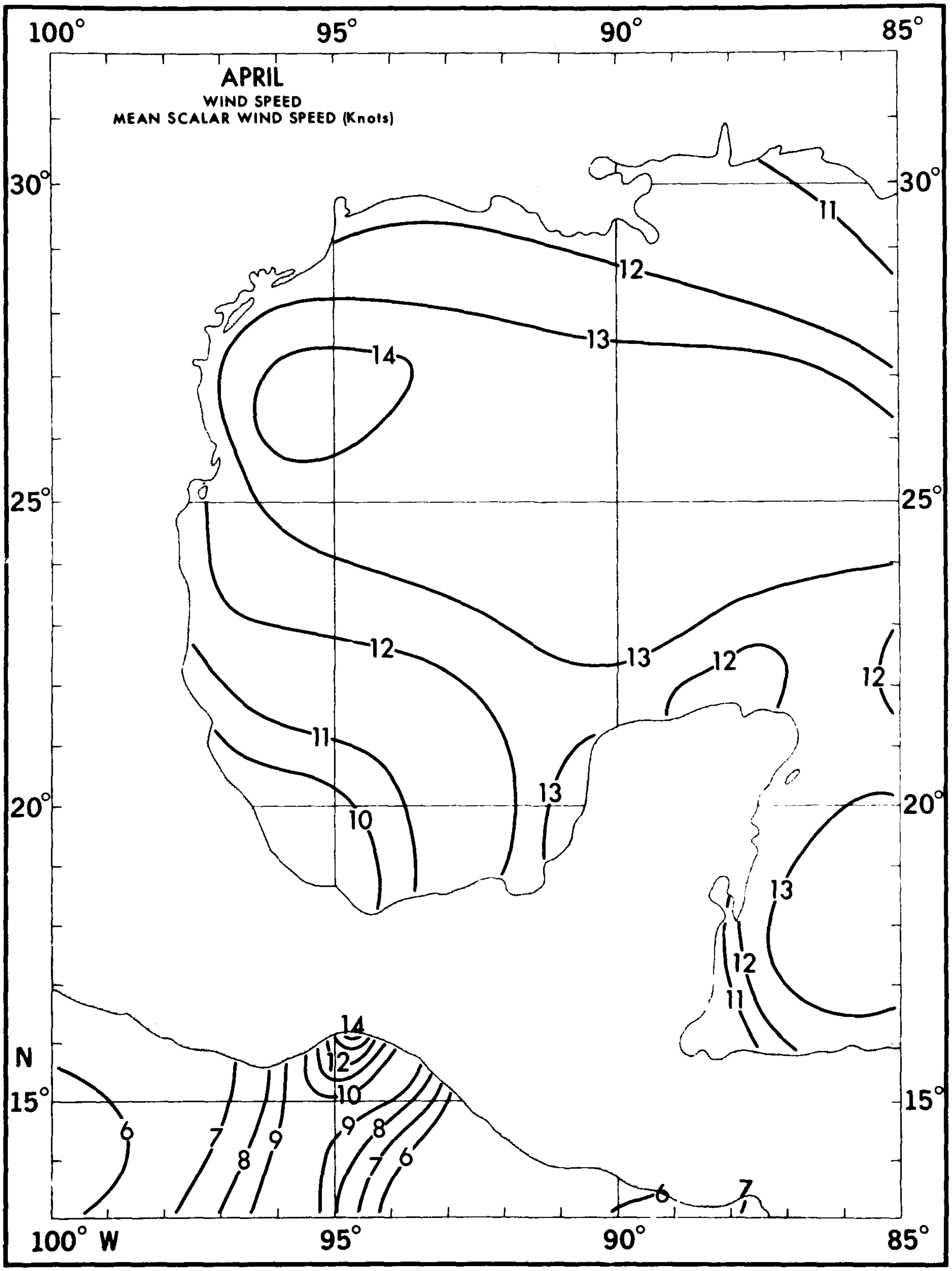

APRIL
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE- DEGREE QUADRANGLES.
<.5 .2
.5 <1 3.1
1 <2 6.7
2 <5 10.0
5 <10 60.0
≥10 20.0
N = 1234
EXAMPLE:
3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥ 1/2 N. MILE.
OTHER PERCENTAGES CAN BE SIMILARLY INTERPRETED.
N = OBSERVATION COUNT.
100°
95°
90°
85°
30°
25°
N
100° W


APRIL
VISIBILITY (NAUTICAL MILES)
85°
90°
95°
100° W.
20°
N 15°

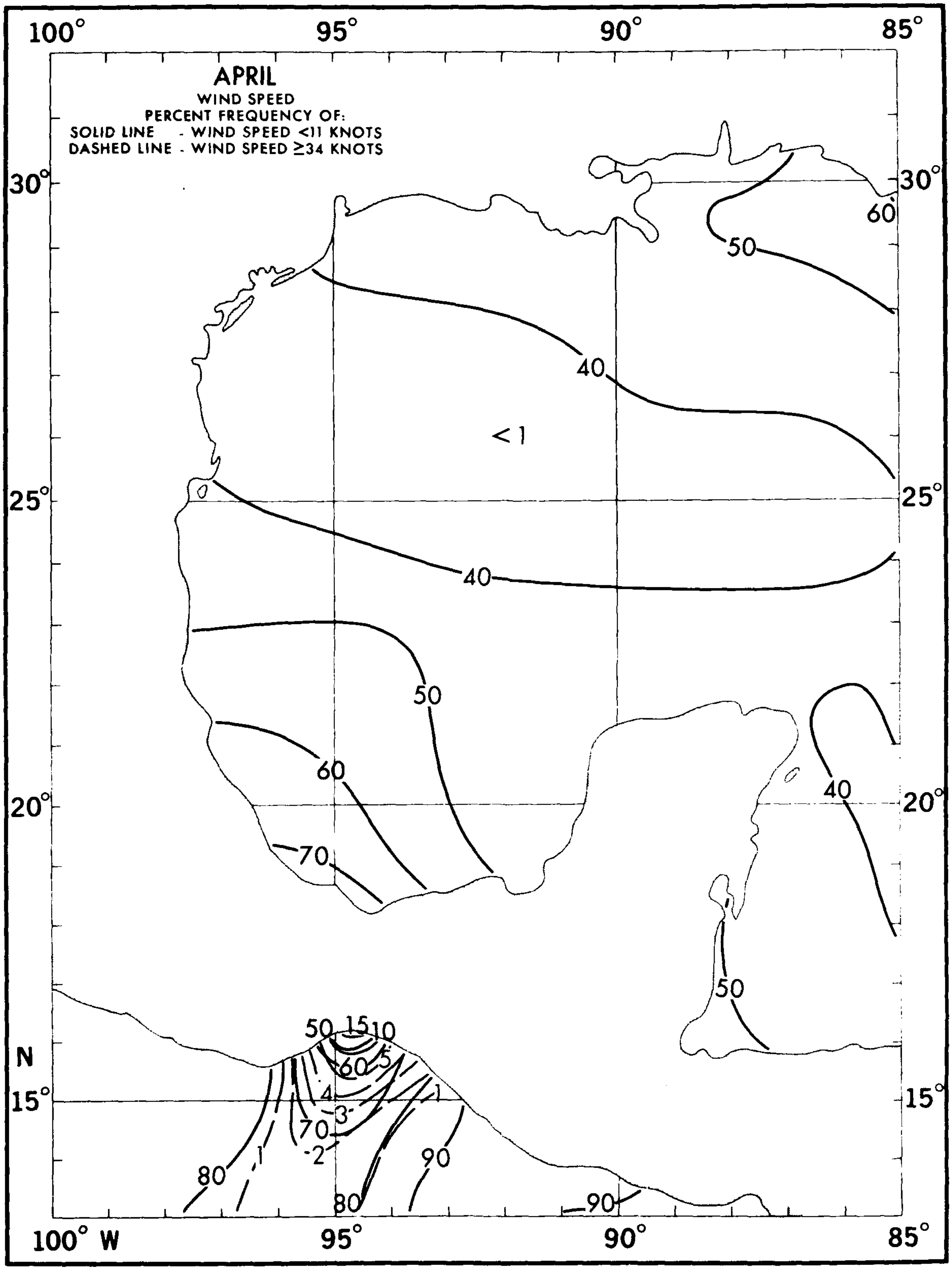

APRIL
CEILING-VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES
DASHED LINE - CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
10
40
15
50
30
20
5
60
<5


APRIL
CEILING-VISIBILITY (LOW RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <300 FEET AND/OR VISIBILITY <1 N. MILE
DASHED LINE - CEILING <600 FEET AND/OR VISIBILITY <2 N. MILES
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
<1
>1

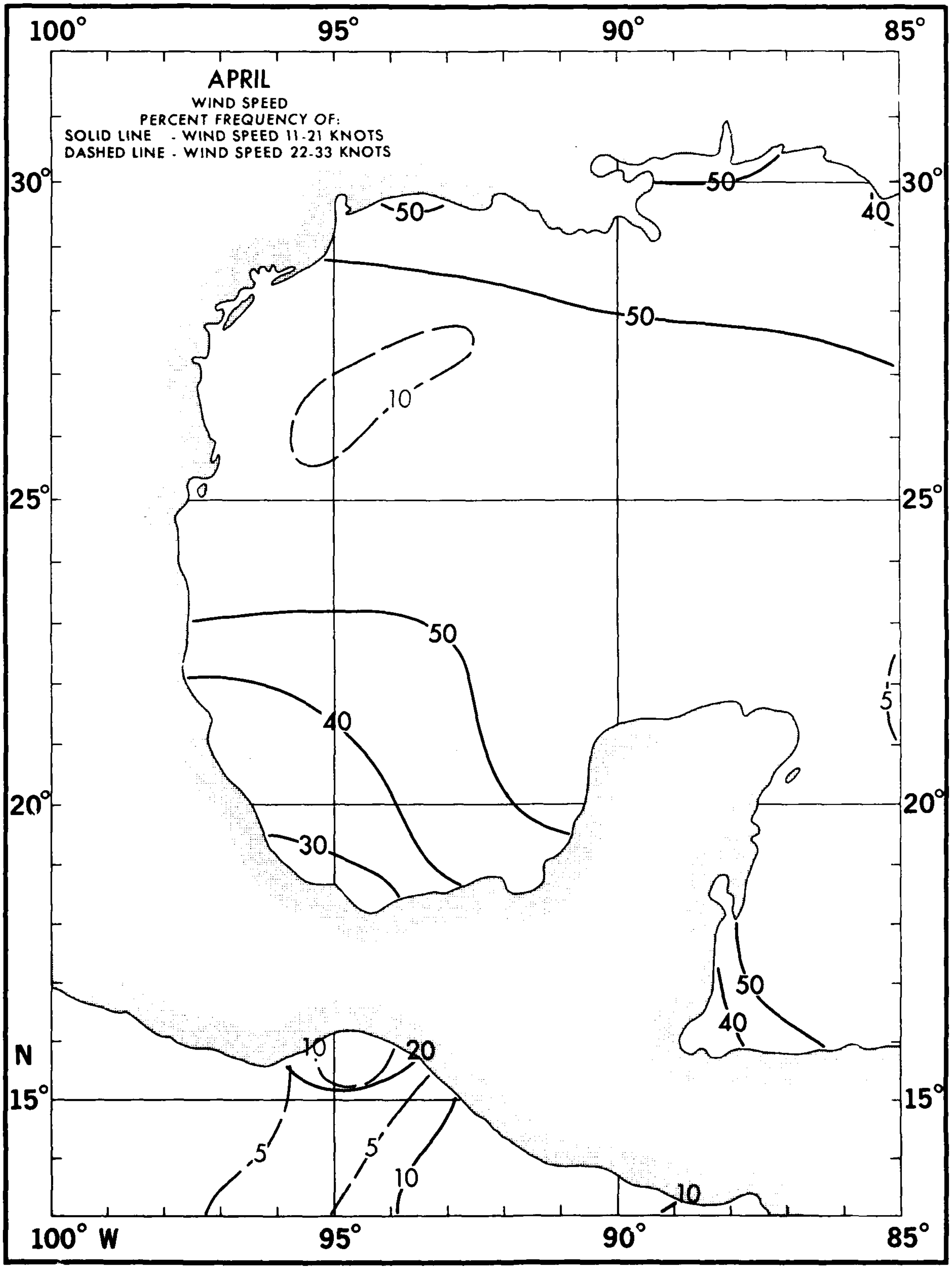

APRIL
WIND-VISIBILITY-CLOUDINESS
SOLID LINE - PERCENT FREQUENCY OF OPTIMUM CONDITIONS: LCC ≥5000 FT., (OR NO LCC), VSBY. ≥5 N. MI. AND WIND 11-21 KTS.
DASHED LINE - PERCENT FREQUENCY OF POOR CONDITIONS. ANY ONE OF THE FOLLOWING CONSTITUTES POOR CONDITIONS: LCC <300 FT., VSBY. <1 N. MI., WIND <6 OR ≥34 KTS.
100°
95°
90°
85°
100° W
30°
25°
20°
15°
N
20
15
35
40
45
10
30
25
50

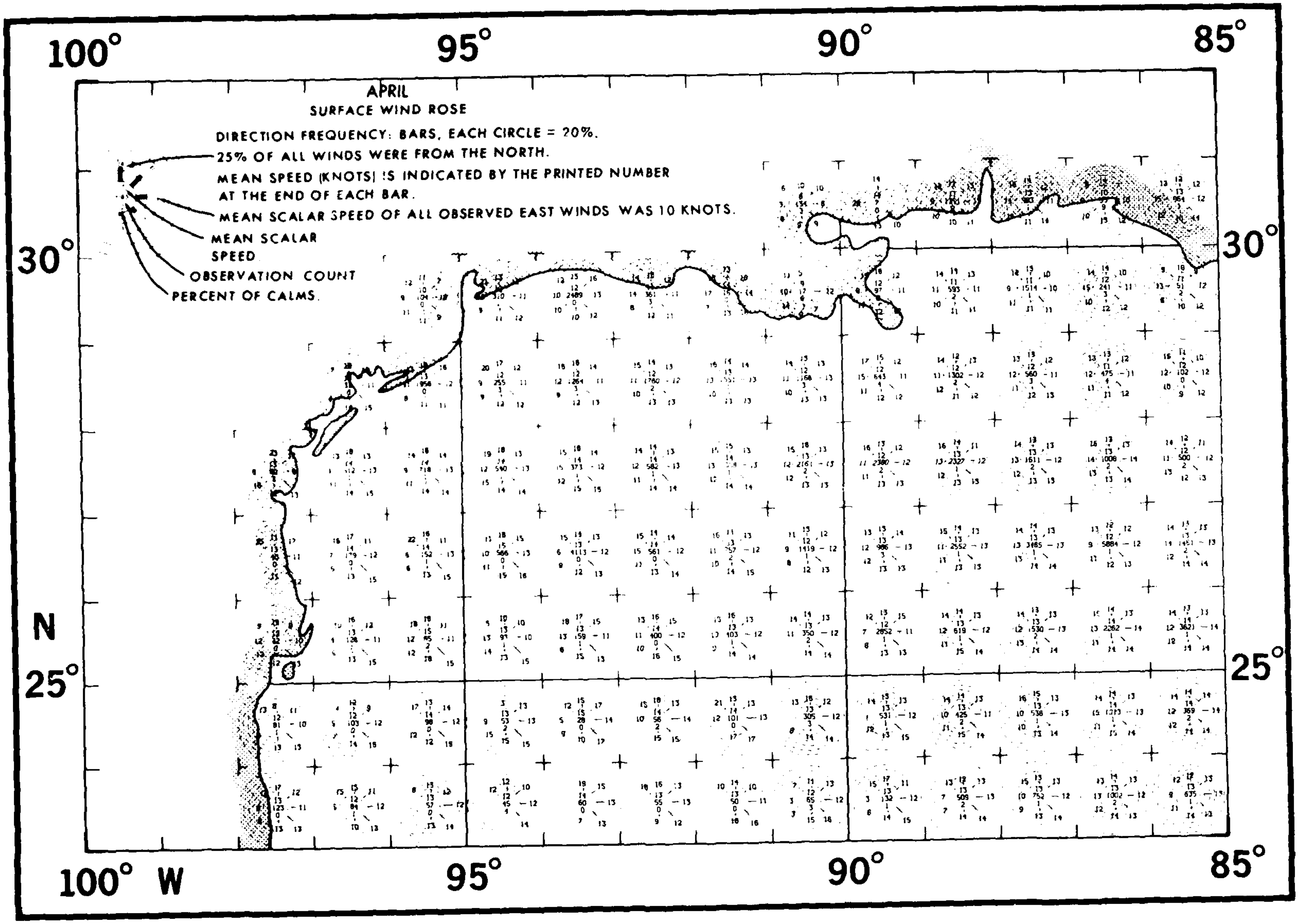


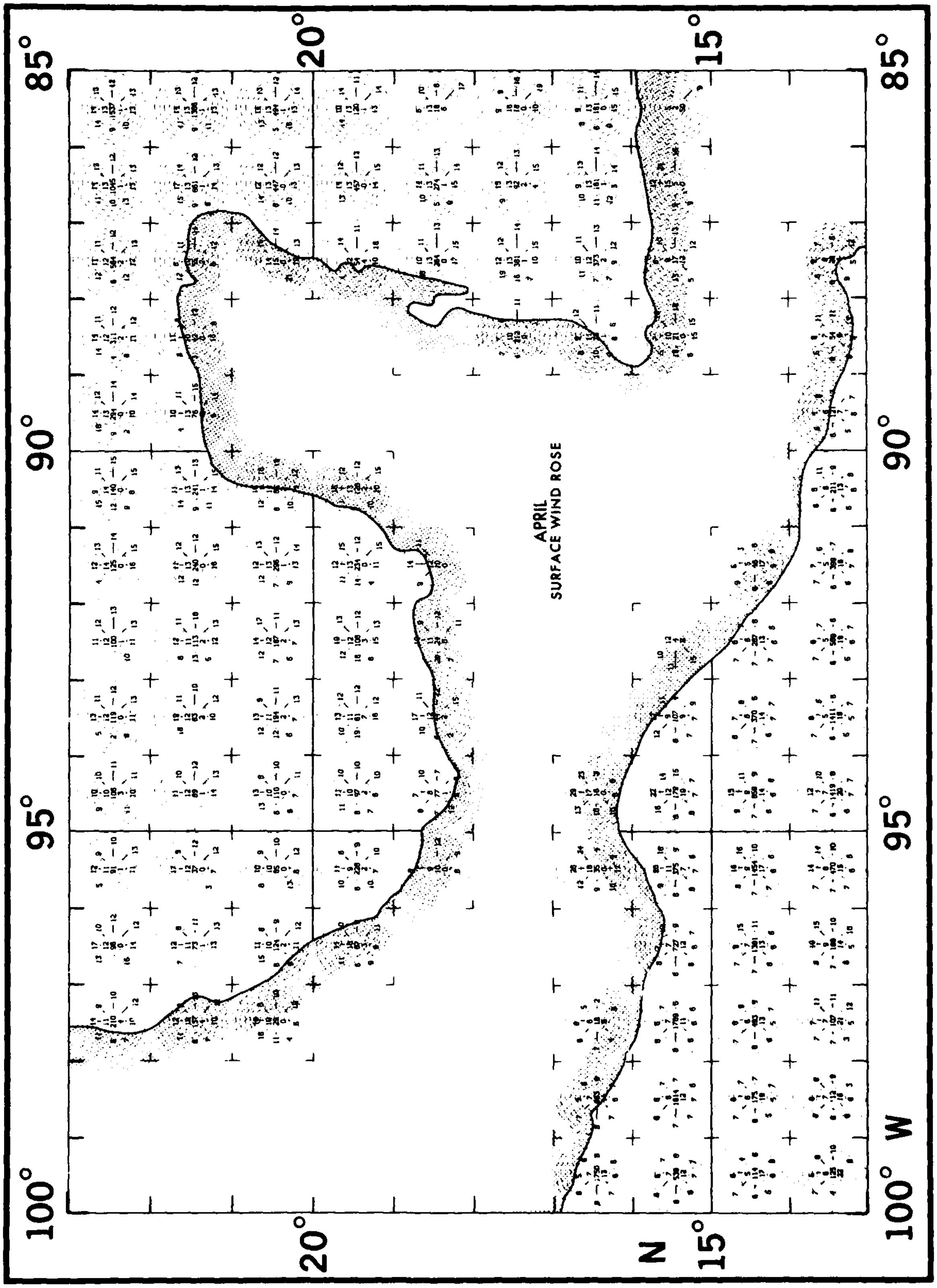
APRIL
WIND SPEED
MEAN SCALAR WIND SPEED (Knots)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
14
13
12
11
10
9
8
7
6

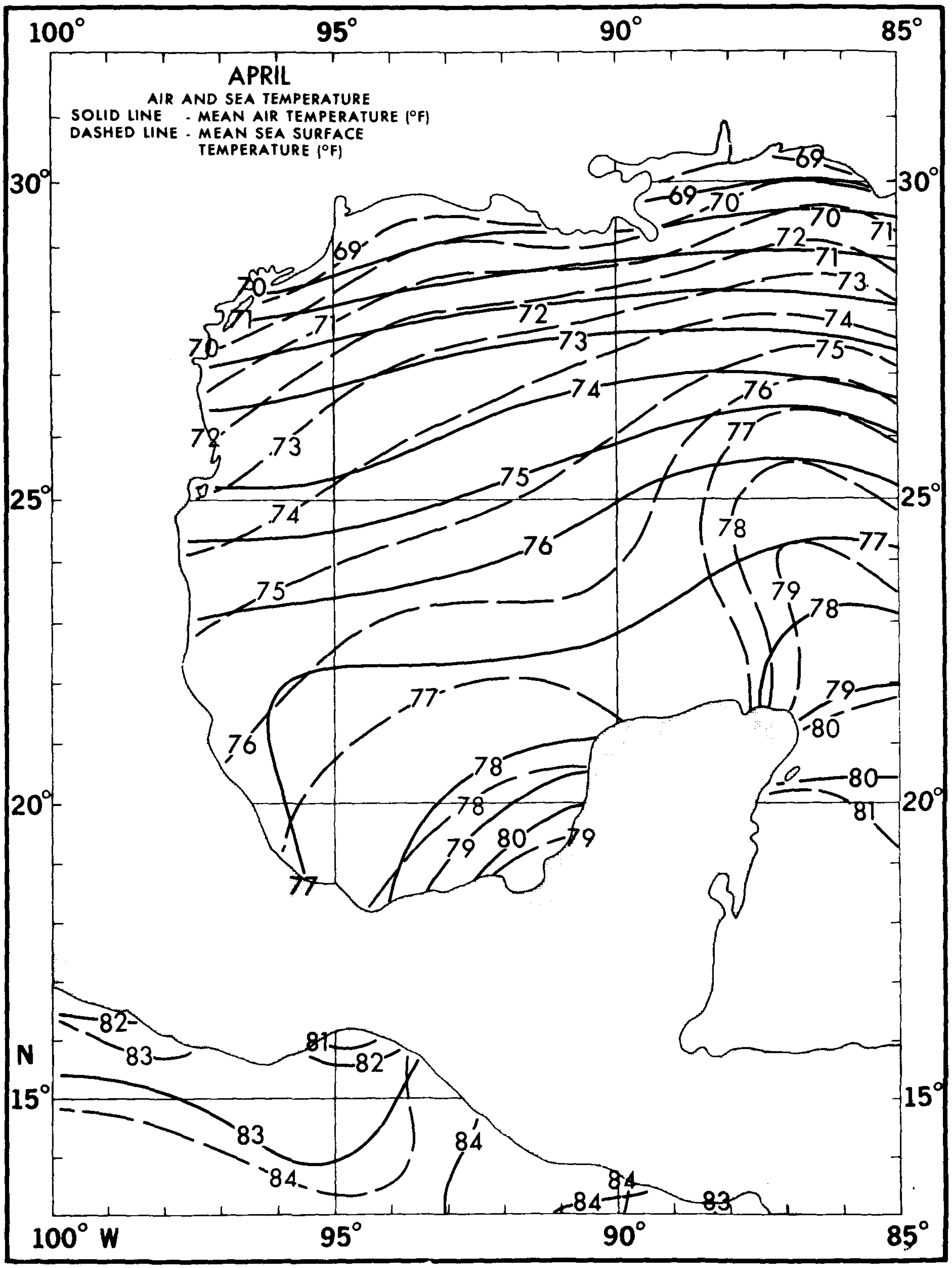


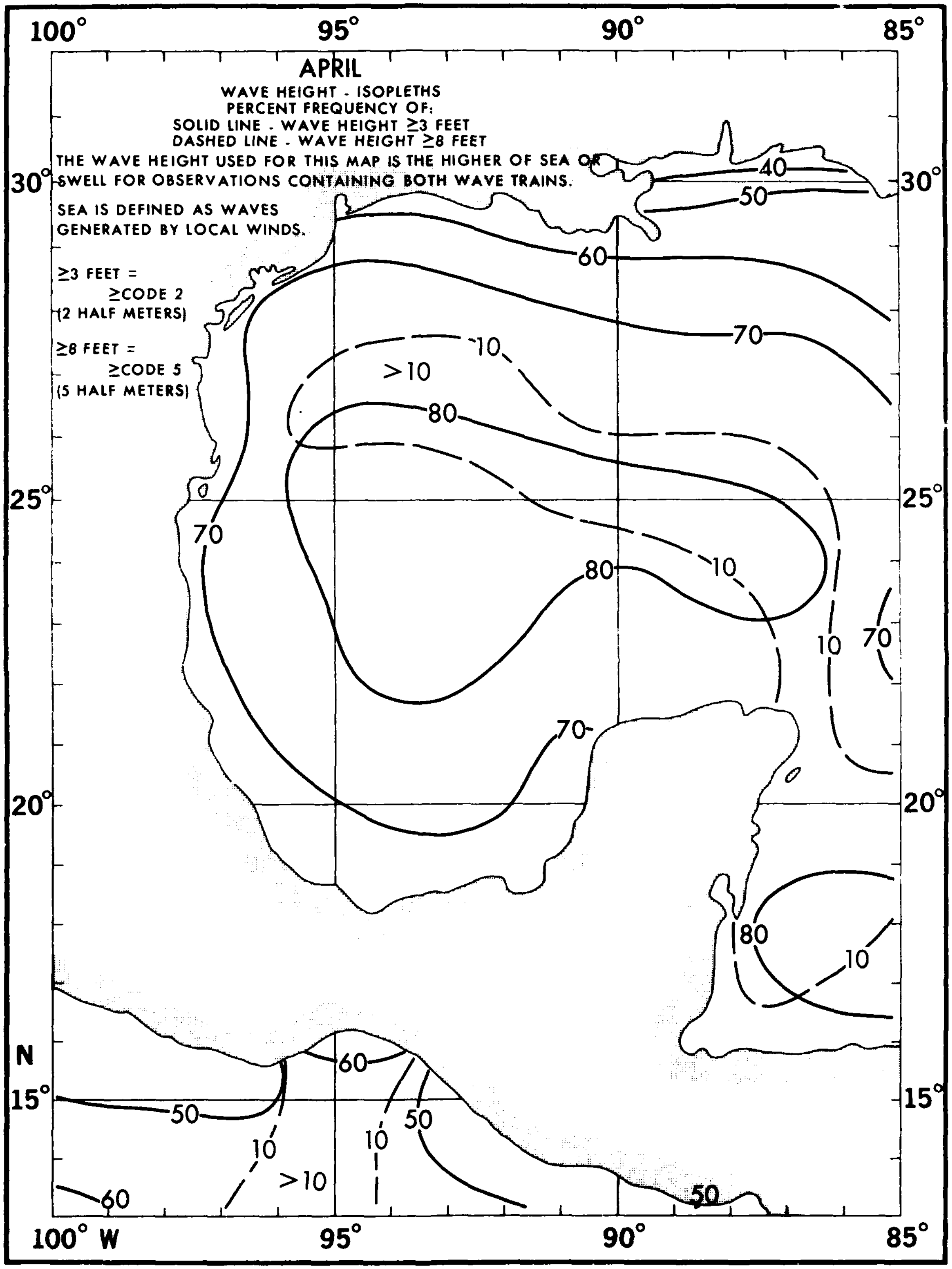
APRIL
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED <11 KNOTS
DASHED LINE - WIND SPEED ≥34 KNOTS
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
< 1
40
50
60
70
80
90

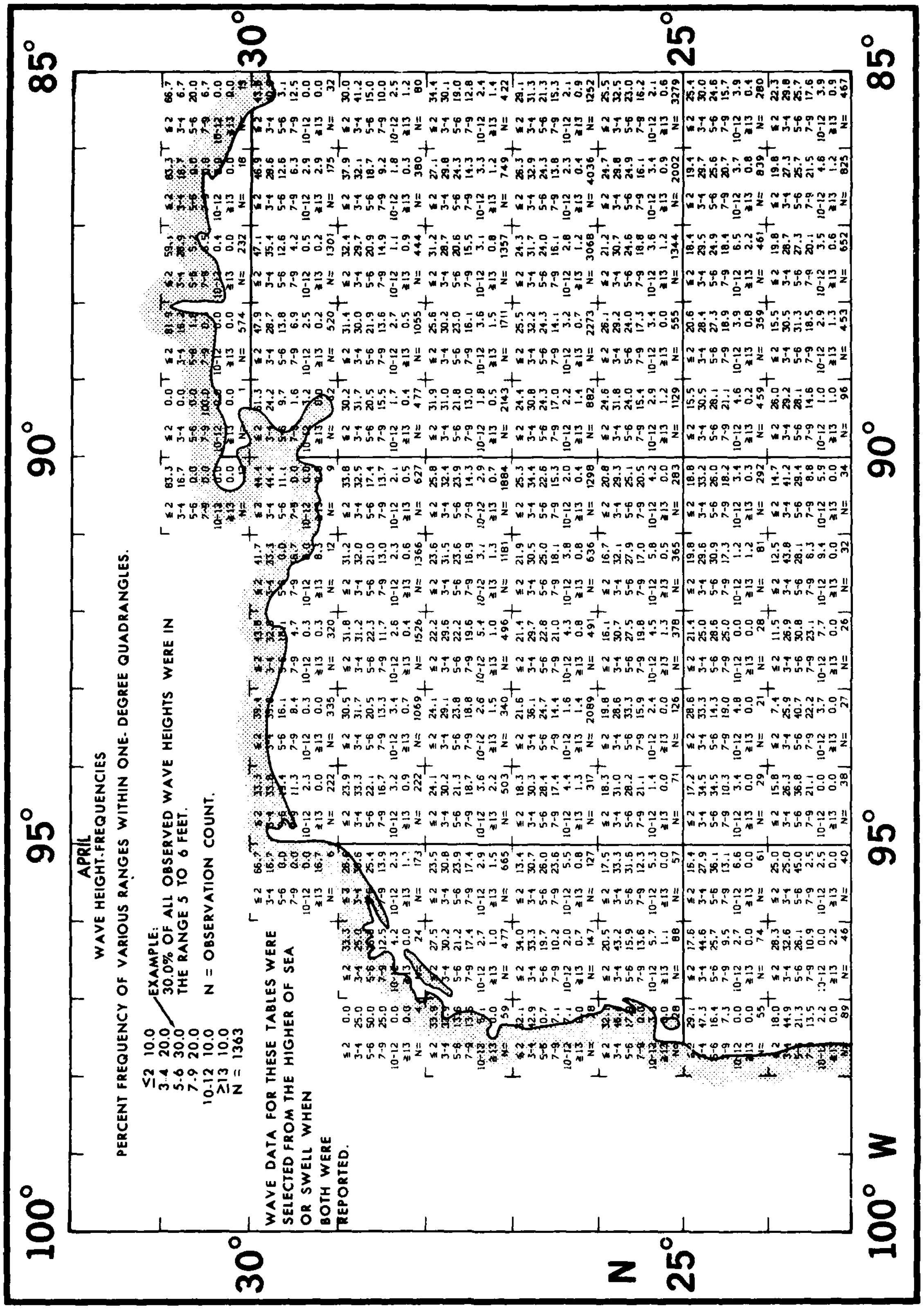

APRIL
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED 11-21 KNOTS
DASHED LINE - WIND SPEED 22-33 KNOTS
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
50
40
10
30
20
5

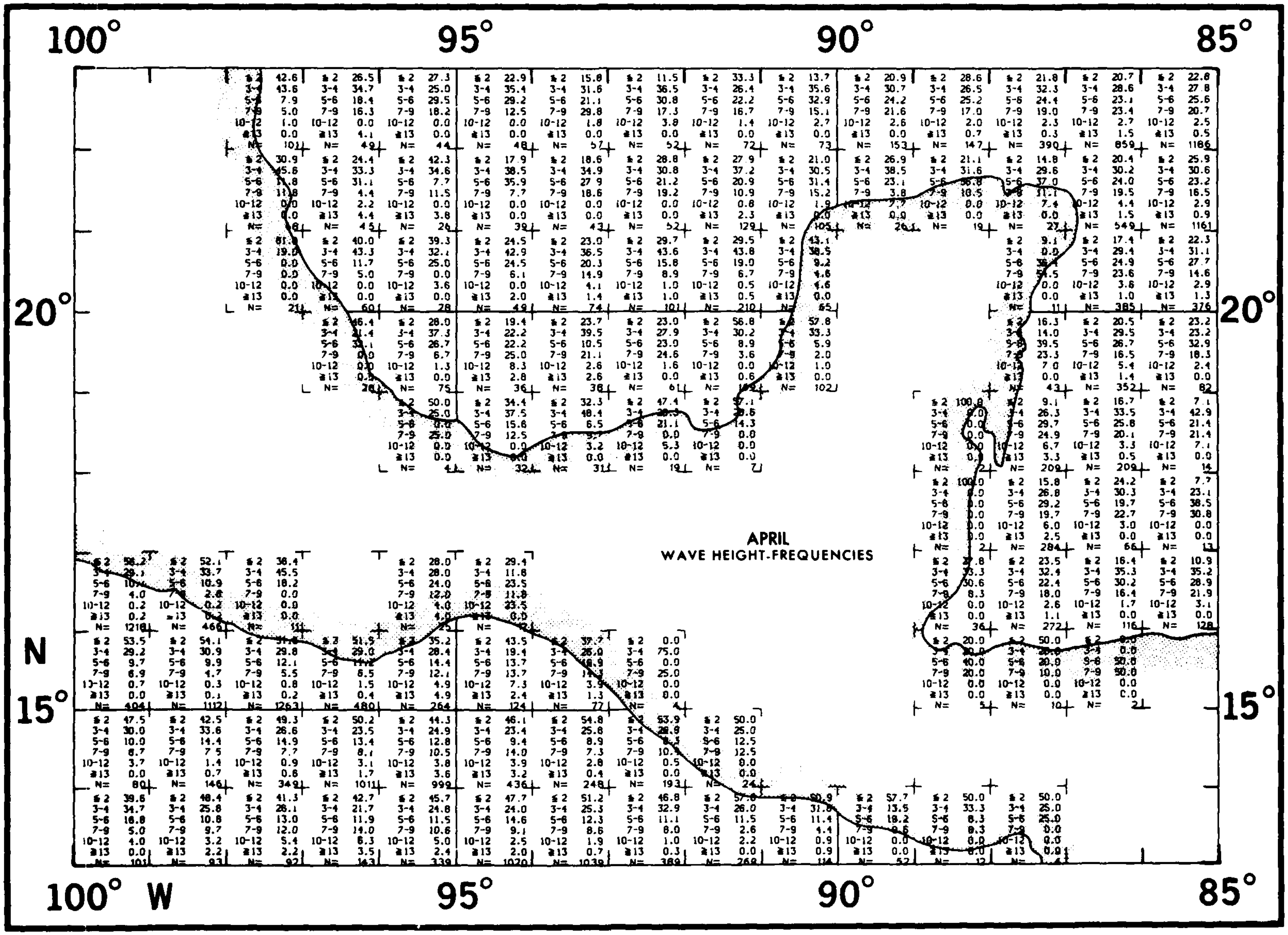

APRIL
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM THE NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED
OBSERVATION COUNT
PERCENT OF CALMS.
100°
95°
90°
85°
30°
25°
N
100° W

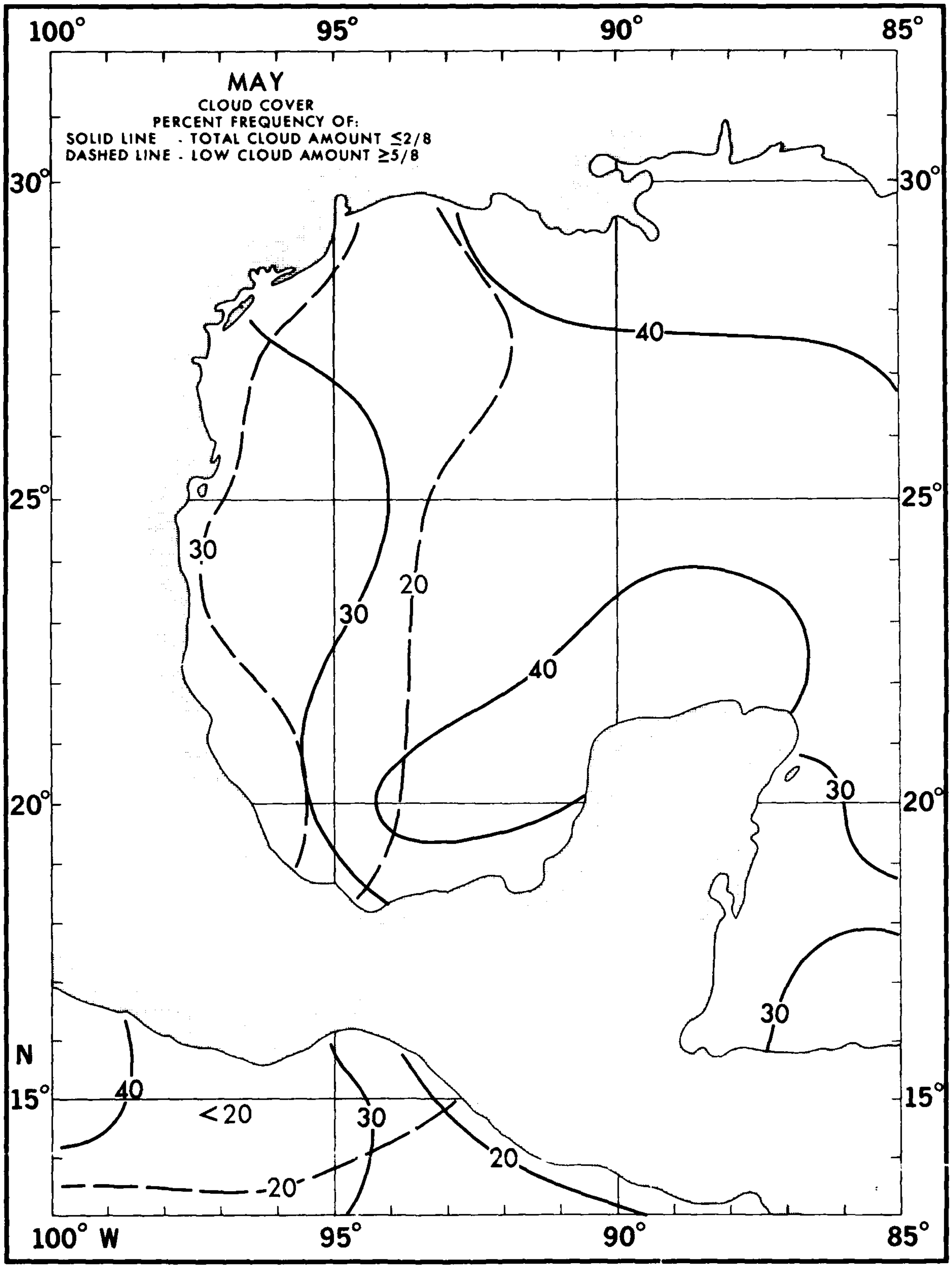

APRIL
SURFACE WIND ROSE
85°
90°
95°
100° W
20°
N 15°

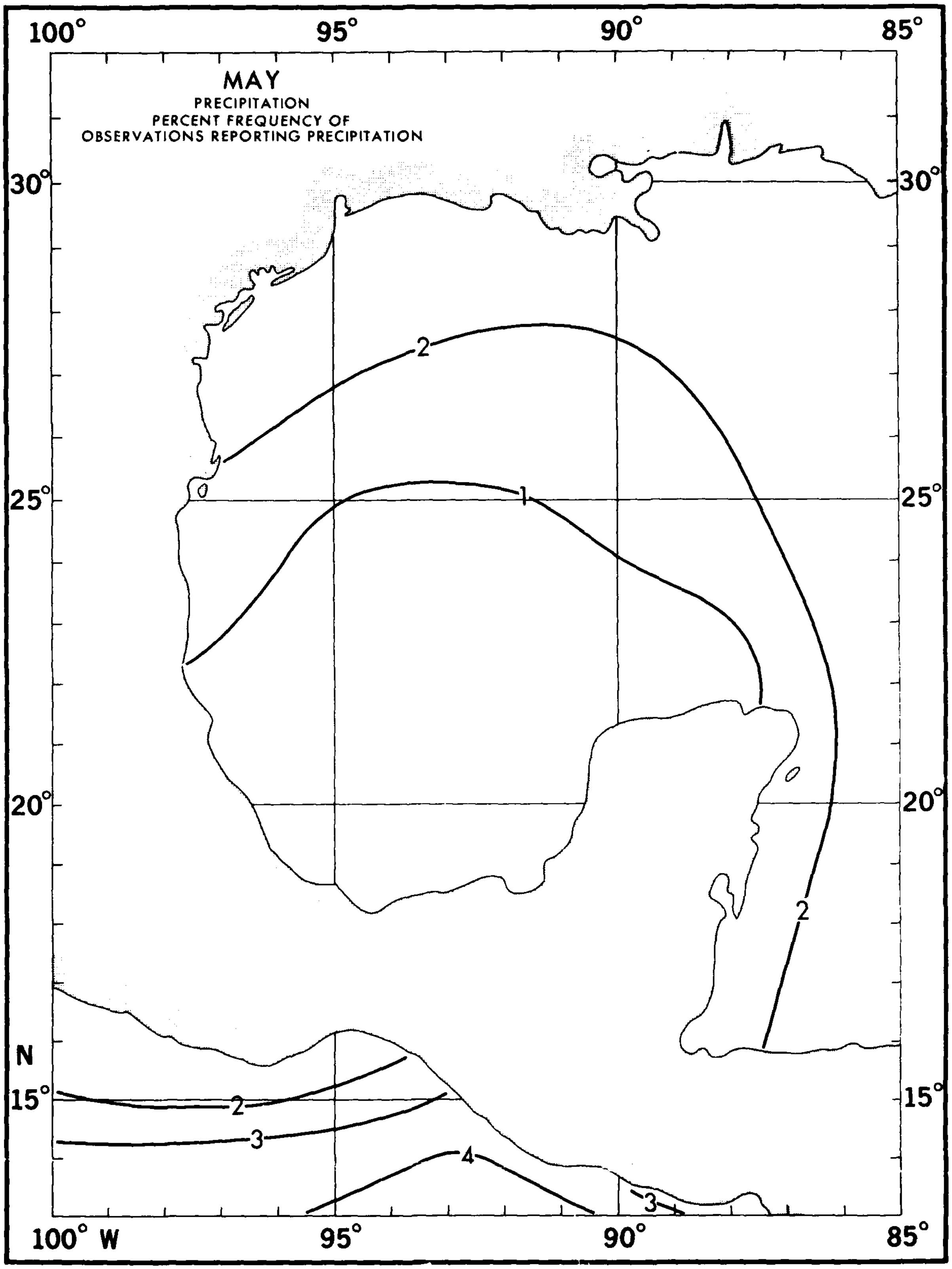

APRIL
AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84

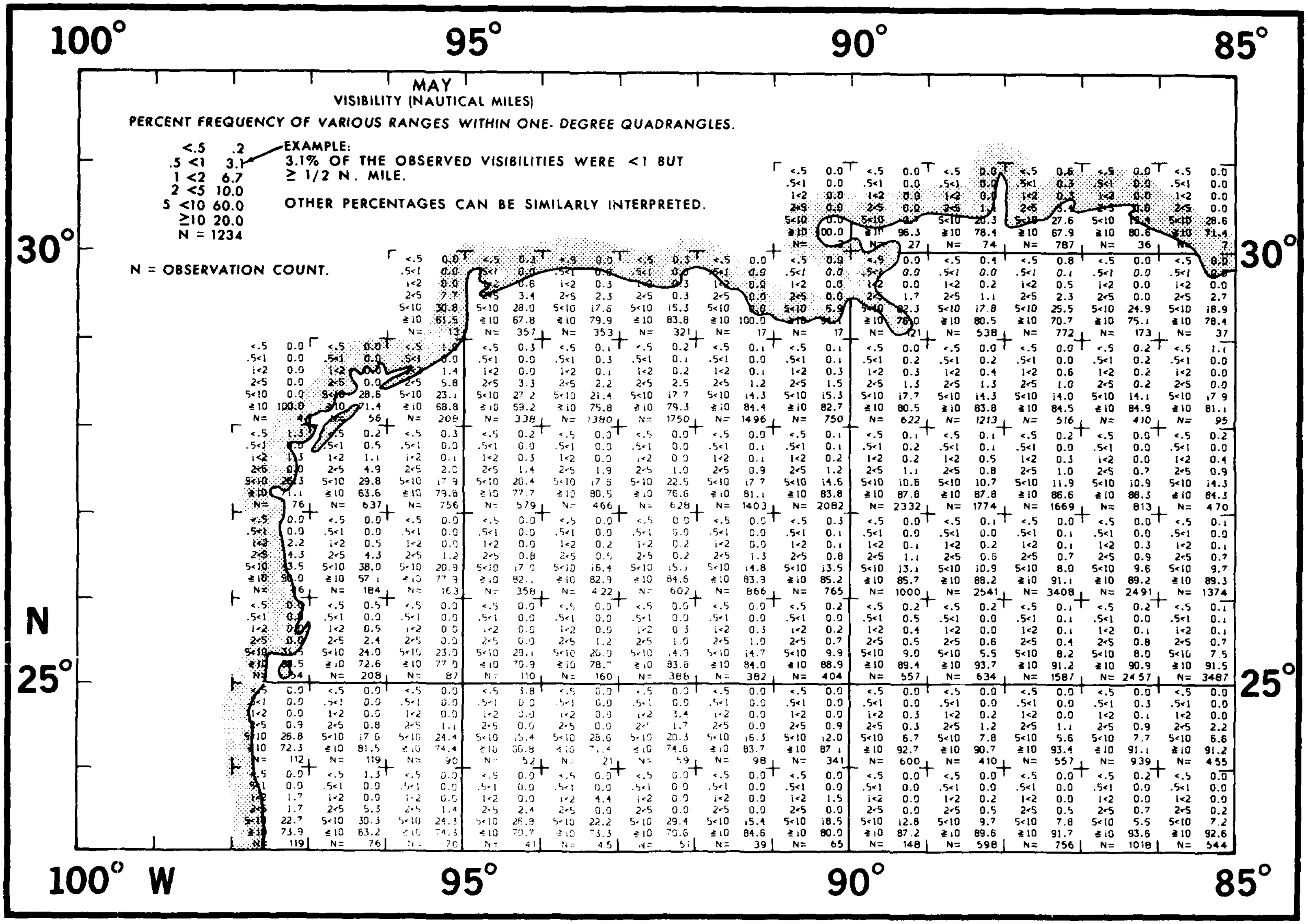

APRIL
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
SOLID LINE - WAVE HEIGHT ≥3 FEET
DASHED LINE - WAVE HEIGHT ≥8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS.
SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
40
50
60
70
10
>10
80
10
80
70
10
70
70
80
10
60
50
10
>10
10
50
60
50

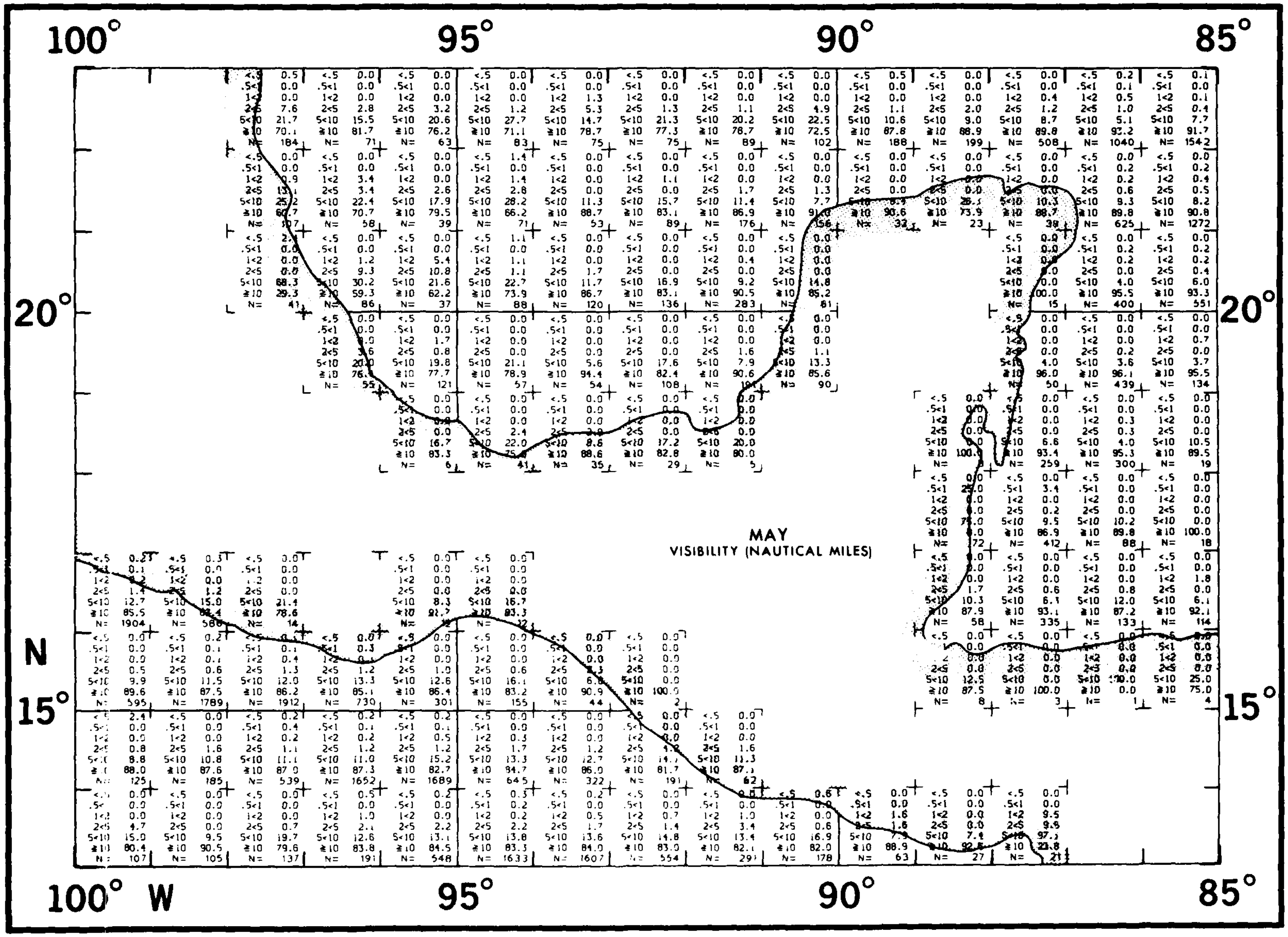

APRIL
WAVE HEIGHT FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
EXAMPLE:
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
100°
95°
90°
85°
30°
25°
N
100° W

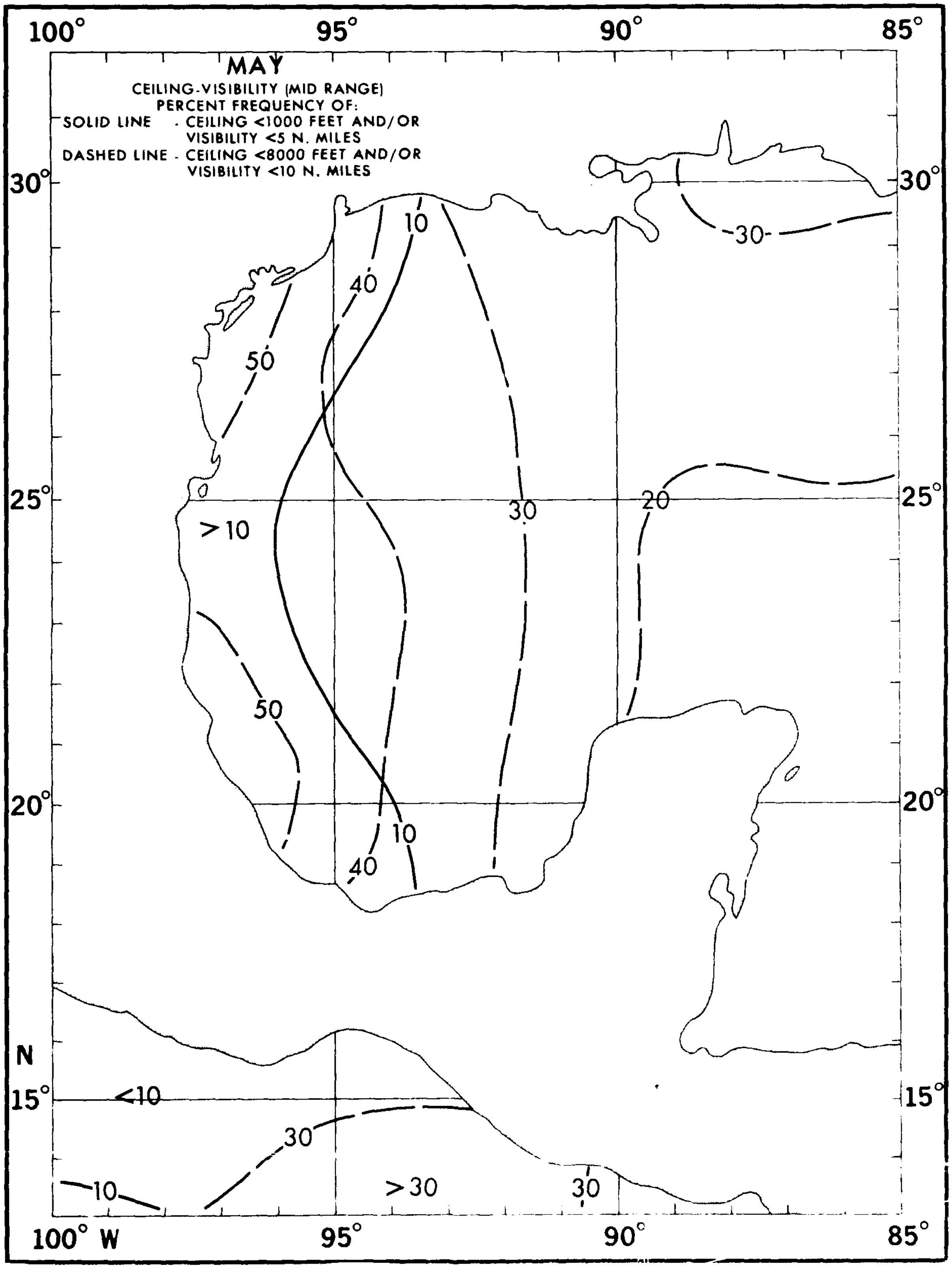

APRIL
WAVE HEIGHT-FREQUENCIES
100°
95°
90°
85°
100° W
20°
N
15°


MAY
CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE - TOTAL CLOUD AMOUNT ≤2/8
DASHED LINE - LOW CLOUD AMOUNT ≥5/8
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
40
30
20
<20

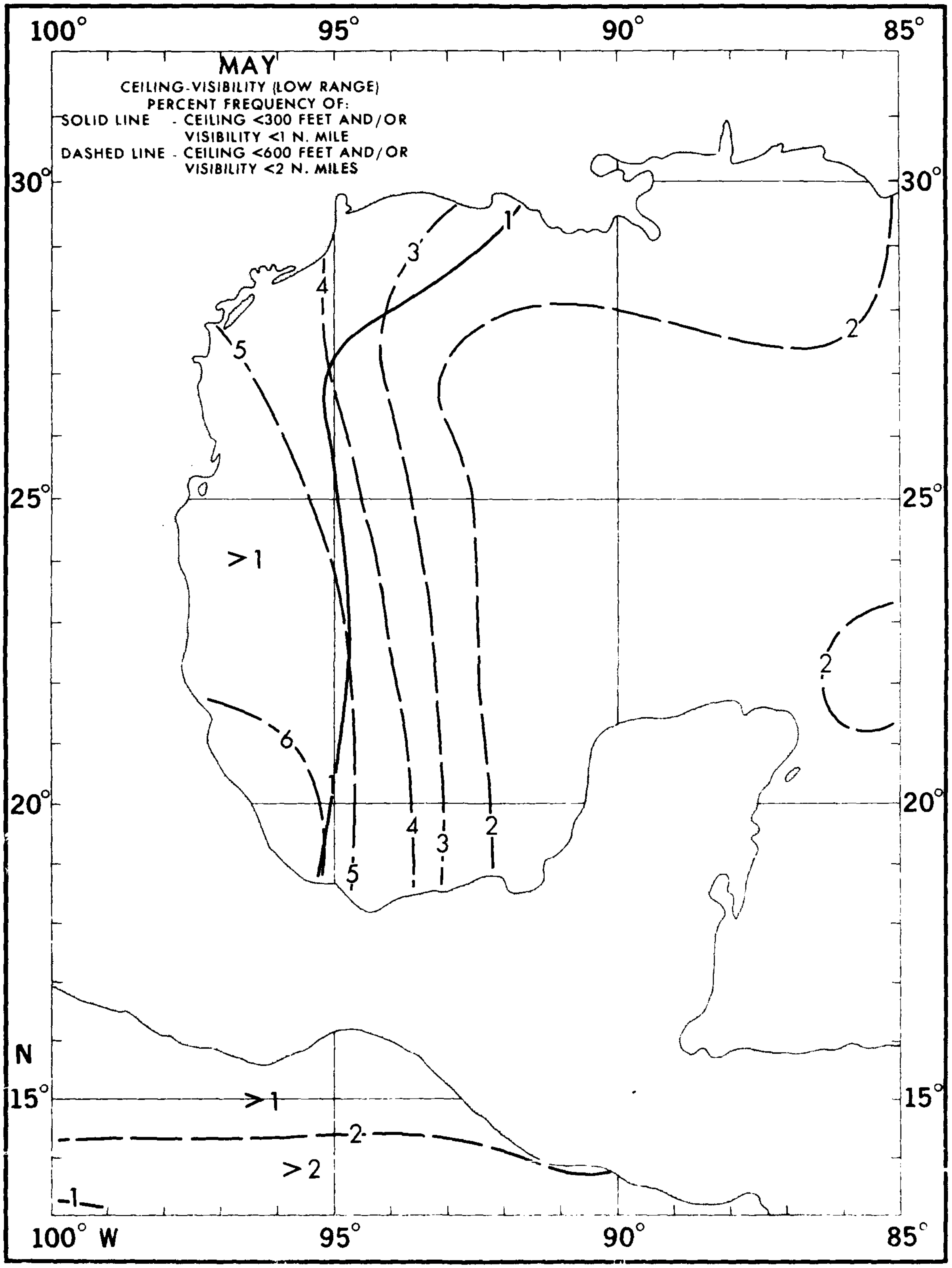

MAY
PRECIPITATION
PERCENT FREQUENCY OF
OBSERVATIONS REPORTING PRECIPITATION
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
2
1
3
4

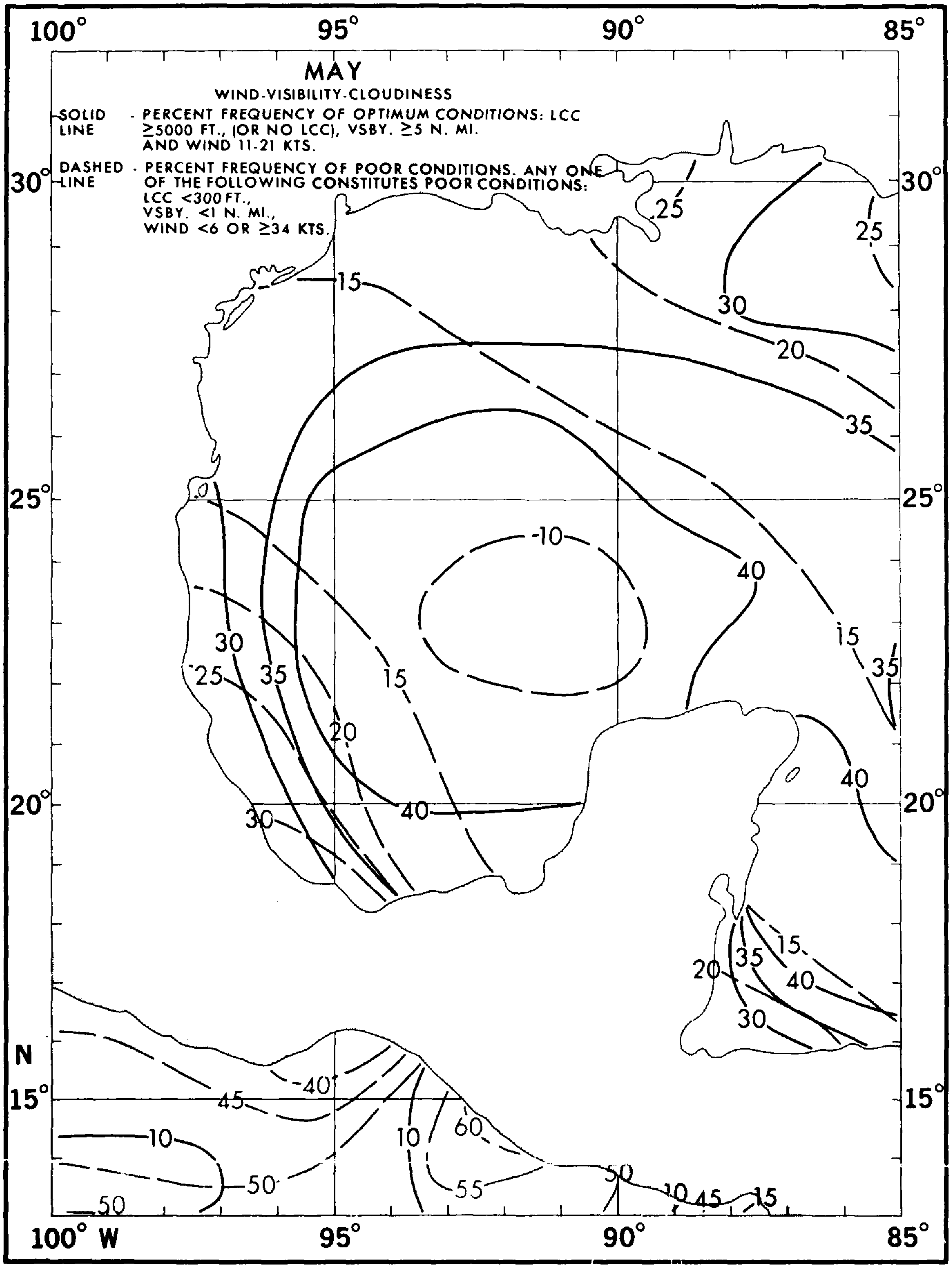

MAY
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE- DEGREE QUADRANGLES.
<.5 .2
.5 <1 3.1
1 <2 6.7
2 <5 10.0
5 <10 60.0
≥10 20.0
N = 1234
EXAMPLE:
3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥ 1/2 N. MILE.
OTHER PERCENTAGES CAN BE SIMILARLY INTERPRETED.
N = OBSERVATION COUNT.
100°
95°
90°
85°
30°
25°
N
100° W

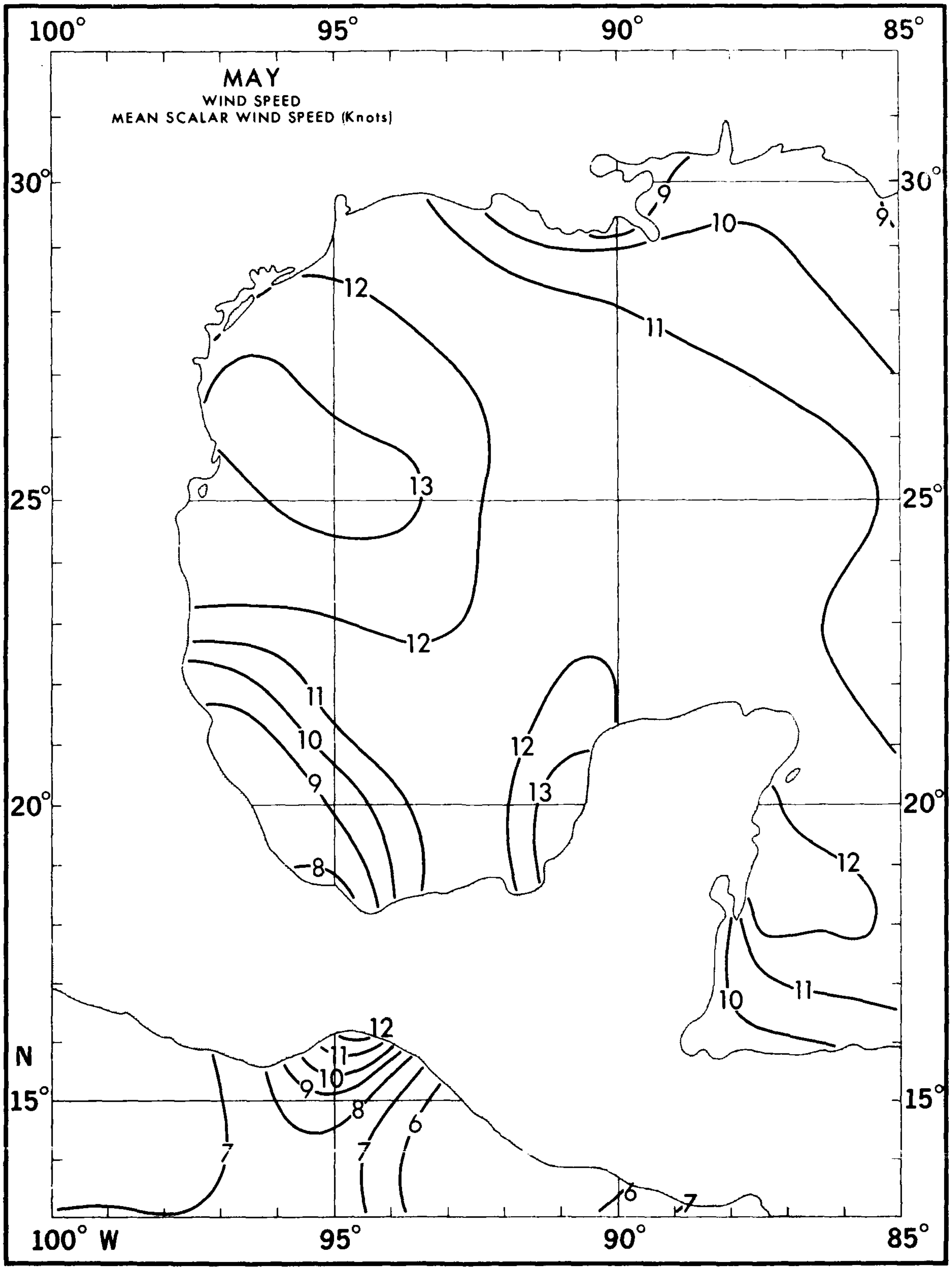

MAY
VISIBILITY (NAUTICAL MILES)
100°
95°
90°
85°
100° W
20°
15°
N



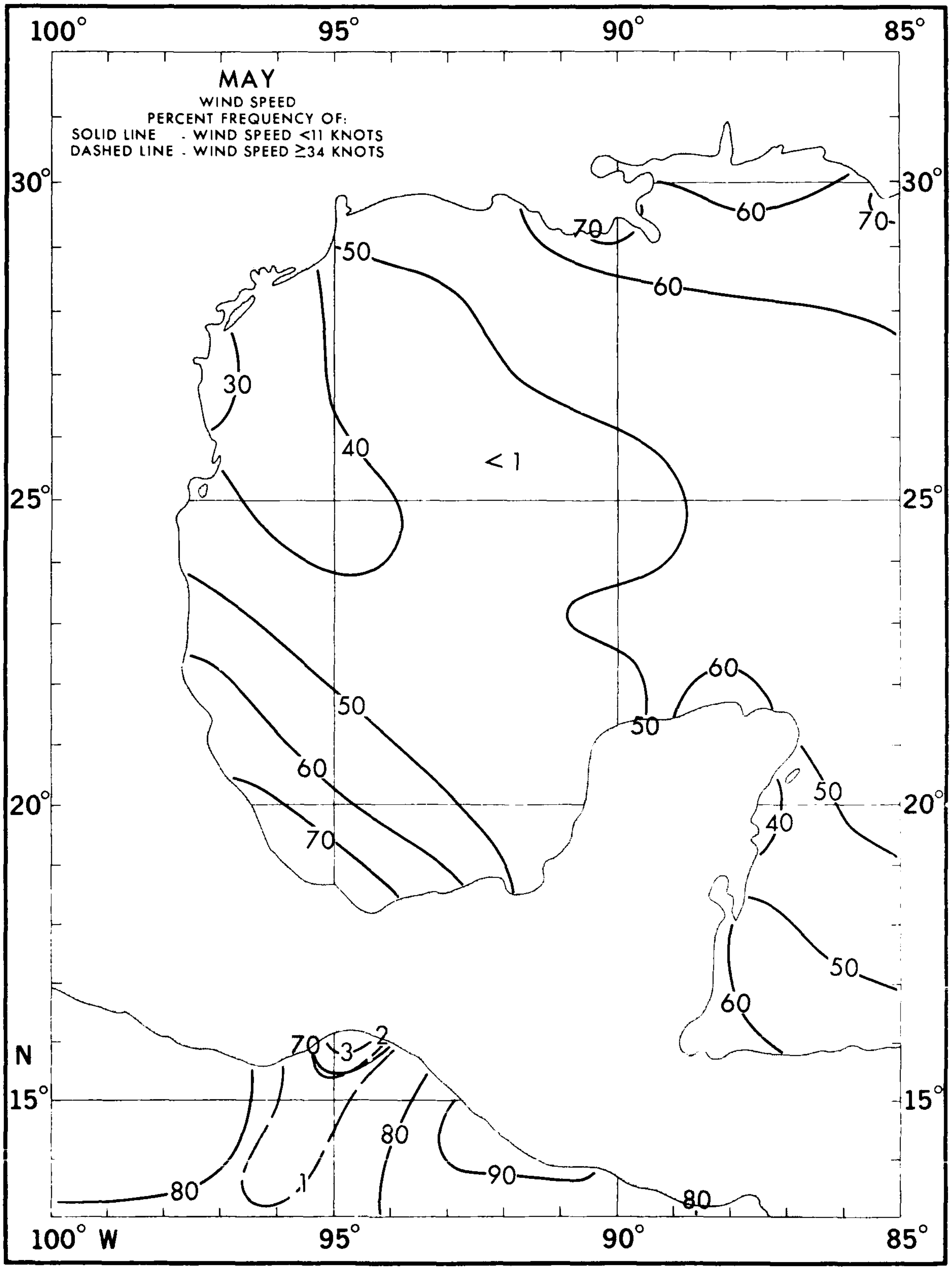
MAY
CEILING-VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES
DASHED LINE - CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
10
40
50
30
20
>10
<10
>30


100°
95°
90°
85°
MAY
CEILING-VISIBILITY (LOW RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <300 FEET AND/OR
VISIBILITY <1 N. MILE
DASHED LINE - CEILING <600 FEET AND/OR
VISIBILITY <2 N. MILES
30°
25°
20°
15°
N
>1
>1
>2
100° W


MAY
WIND-VISIBILITY-CLOUDINESS
SOLID LINE - PERCENT FREQUENCY OF OPTIMUM CONDITIONS: LCC ≥5000 FT., (OR NO LCC), VSBY. ≥5 N. MI. AND WIND 11-21 KTS.
DASHED LINE - PERCENT FREQUENCY OF POOR CONDITIONS. ANY ONE OF THE FOLLOWING CONSTITUTES POOR CONDITIONS:
LCC <300 FT.,
VSBY. <1 N. MI.,
WIND <6 OR ≥34 KTS.
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W

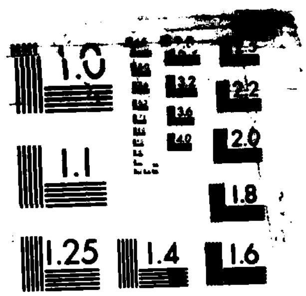


MAY
WIND SPEED
MEAN SCALAR WIND SPEED (Knots)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
13
12
11
10
9
8
7
6

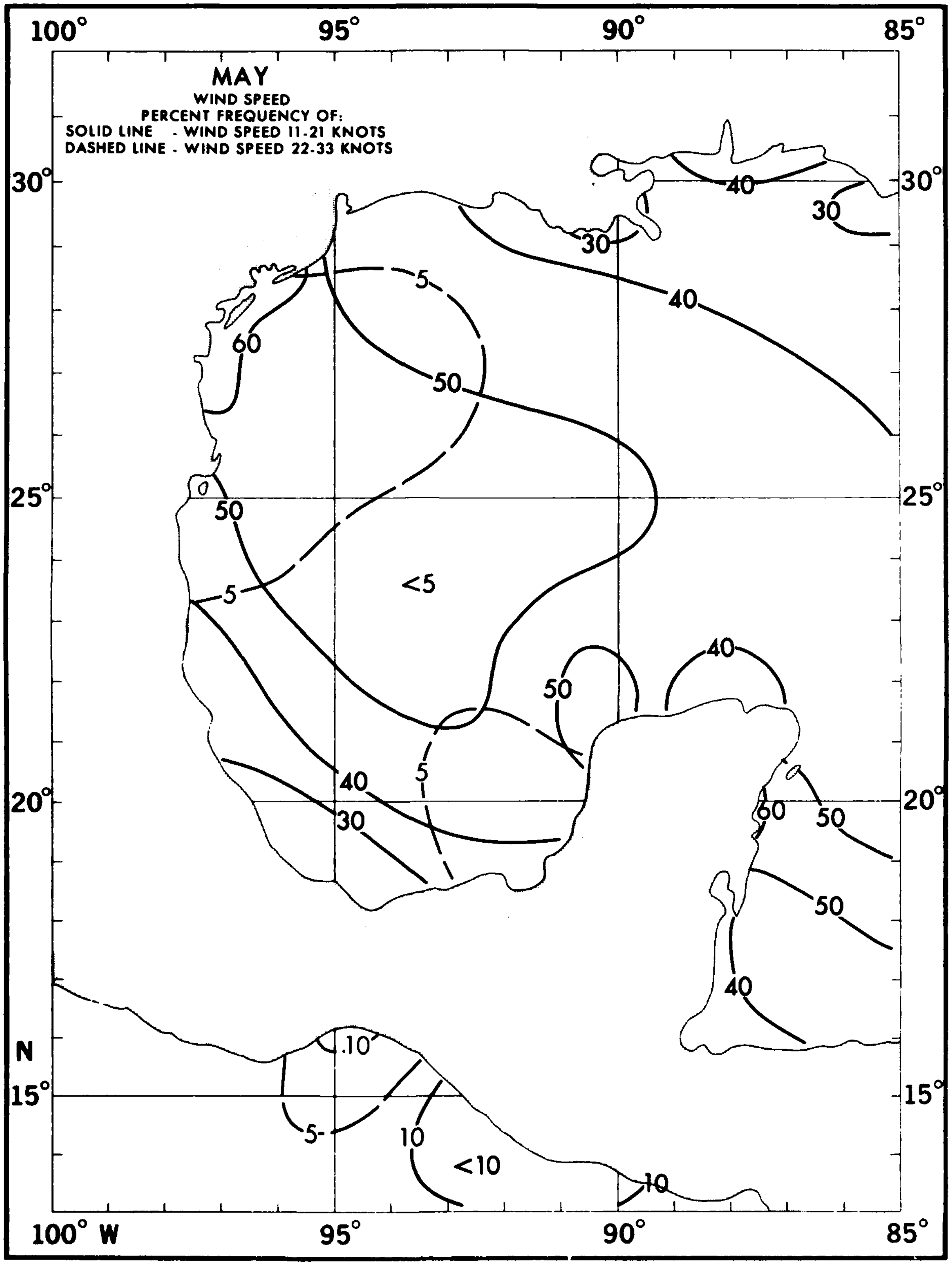

MAY
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED <11 KNOTS
DASHED LINE - WIND SPEED ≥34 KNOTS
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
< 1
30
40
50
60
70
80
90
1
2
3

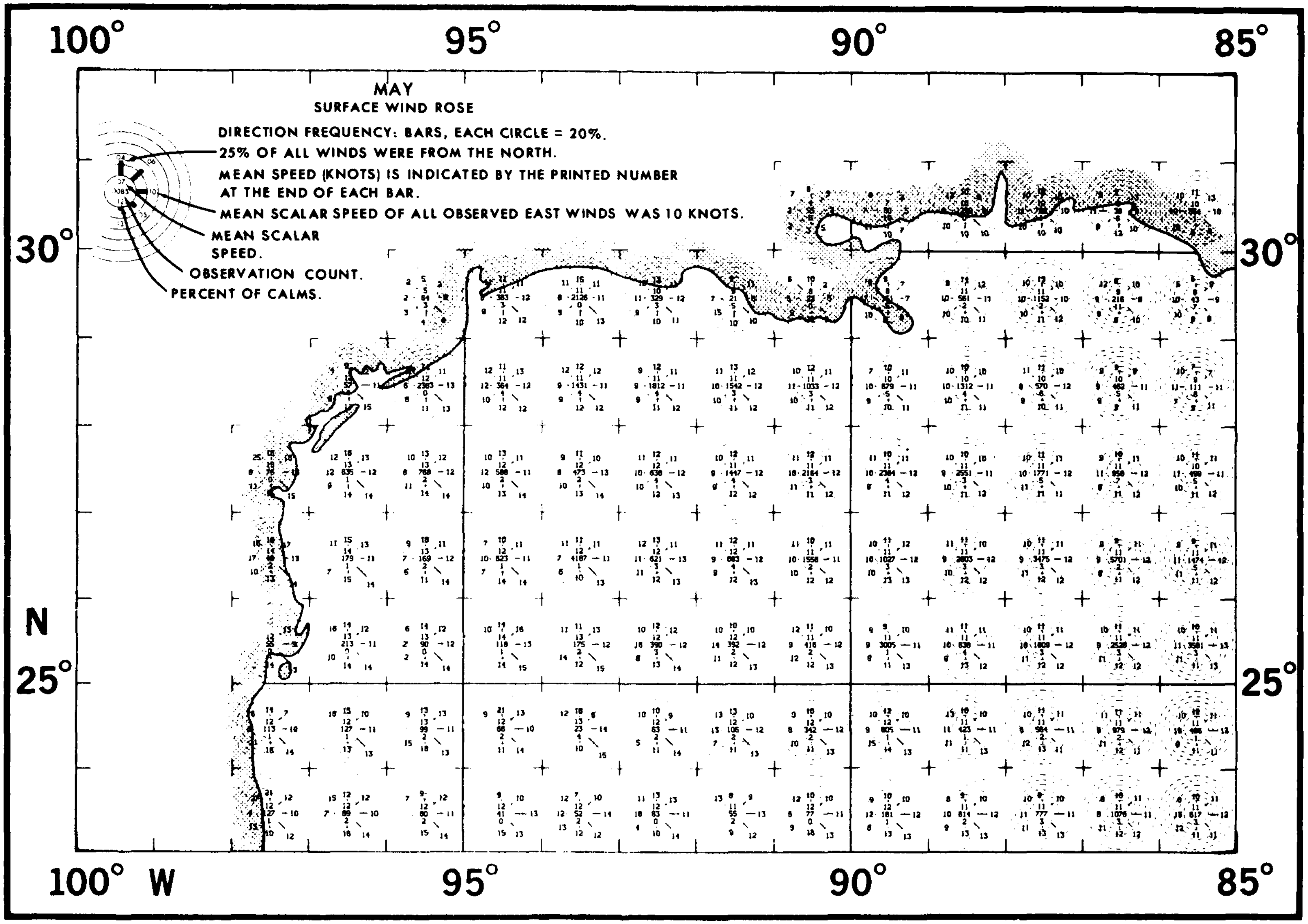
AD-A175 250 US NAVY CLIMATIC STUDY OF THE CARIBBEAN SEA AND GULF OF MEXICO VOLUME 4 G...(U) NAVAL AIR SYSTEMS COMMAND WASHINGTON DC SEP 86 NAVAIR-50-1C-546 2/3

UNCLASSIFIED F/G 4/2 NL

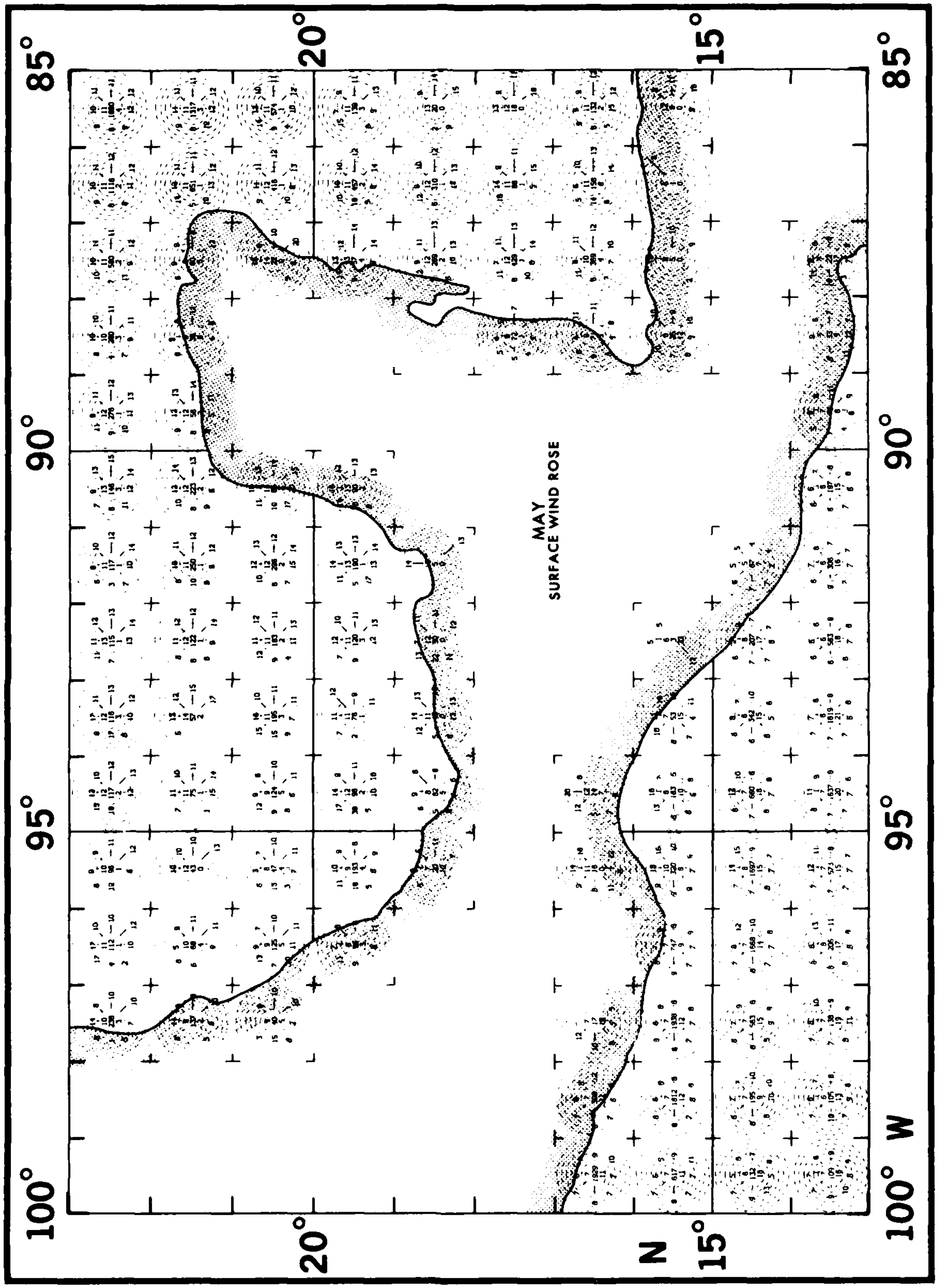


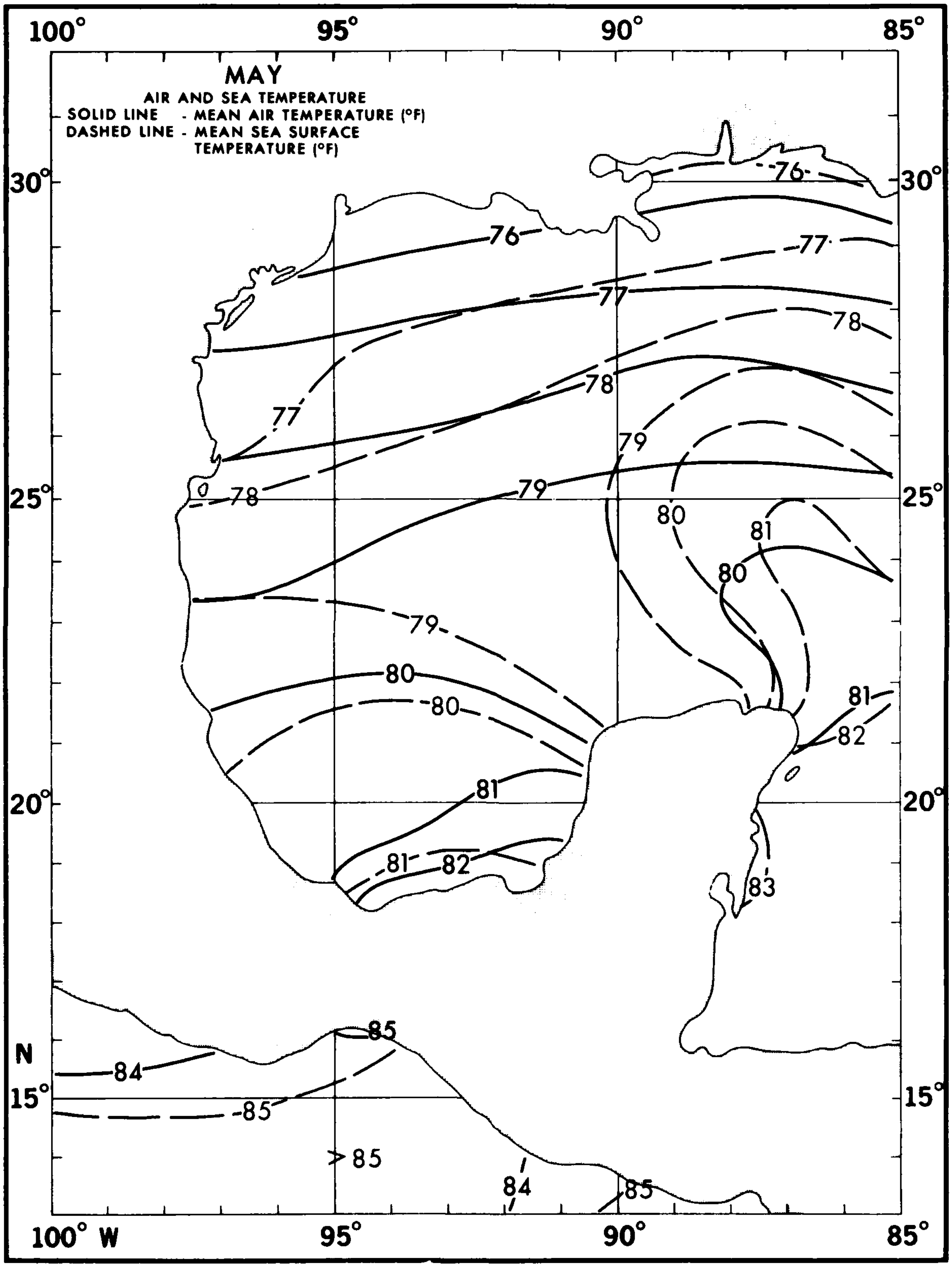
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A


MAY
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED 11-21 KNOTS
DASHED LINE - WIND SPEED 22-33 KNOTS
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
40
30
30
40
60
5
50
50
<5
5
50
40
40
5
30
60
50
50
40
.10
5-
10
<10
10

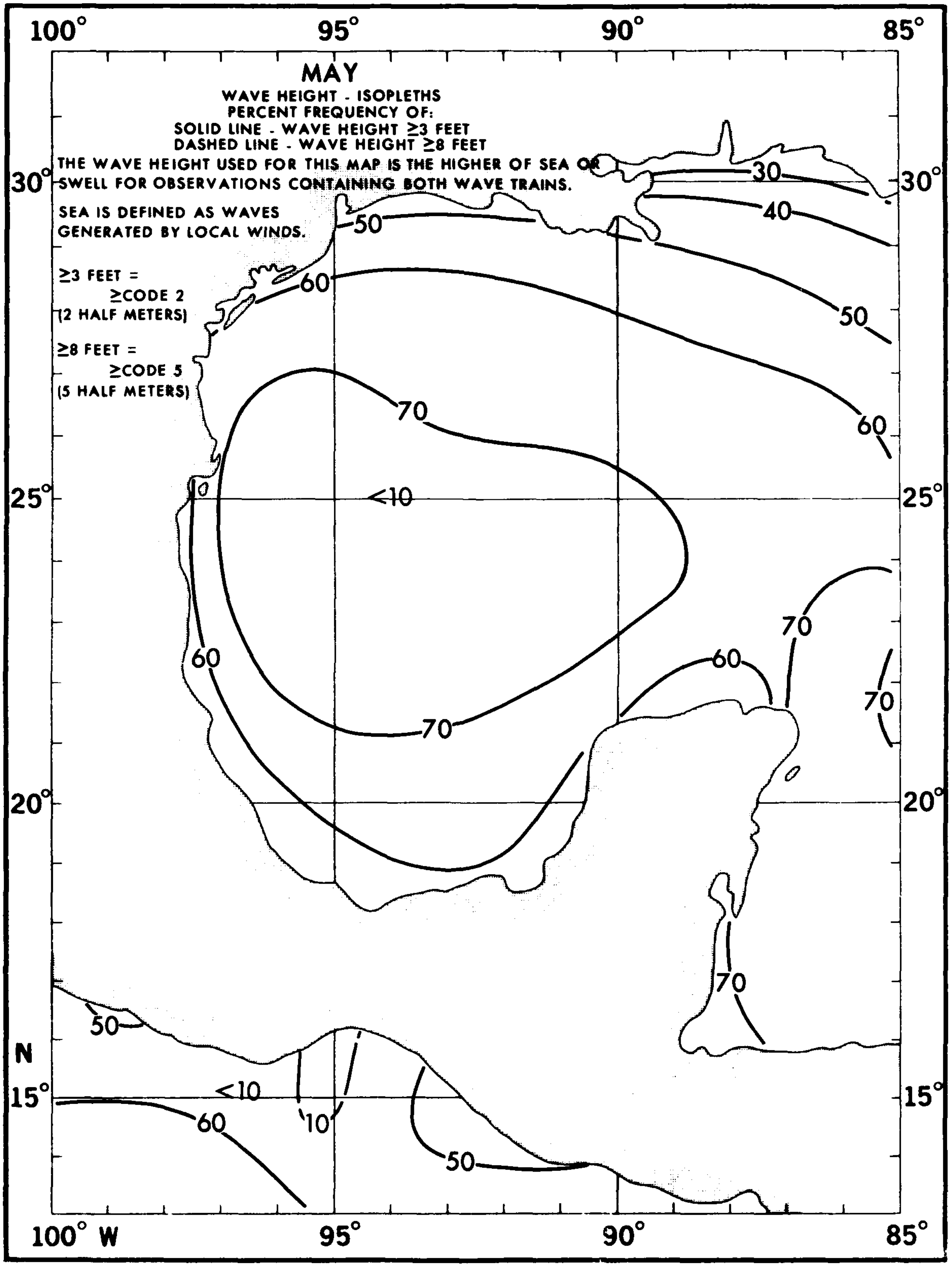


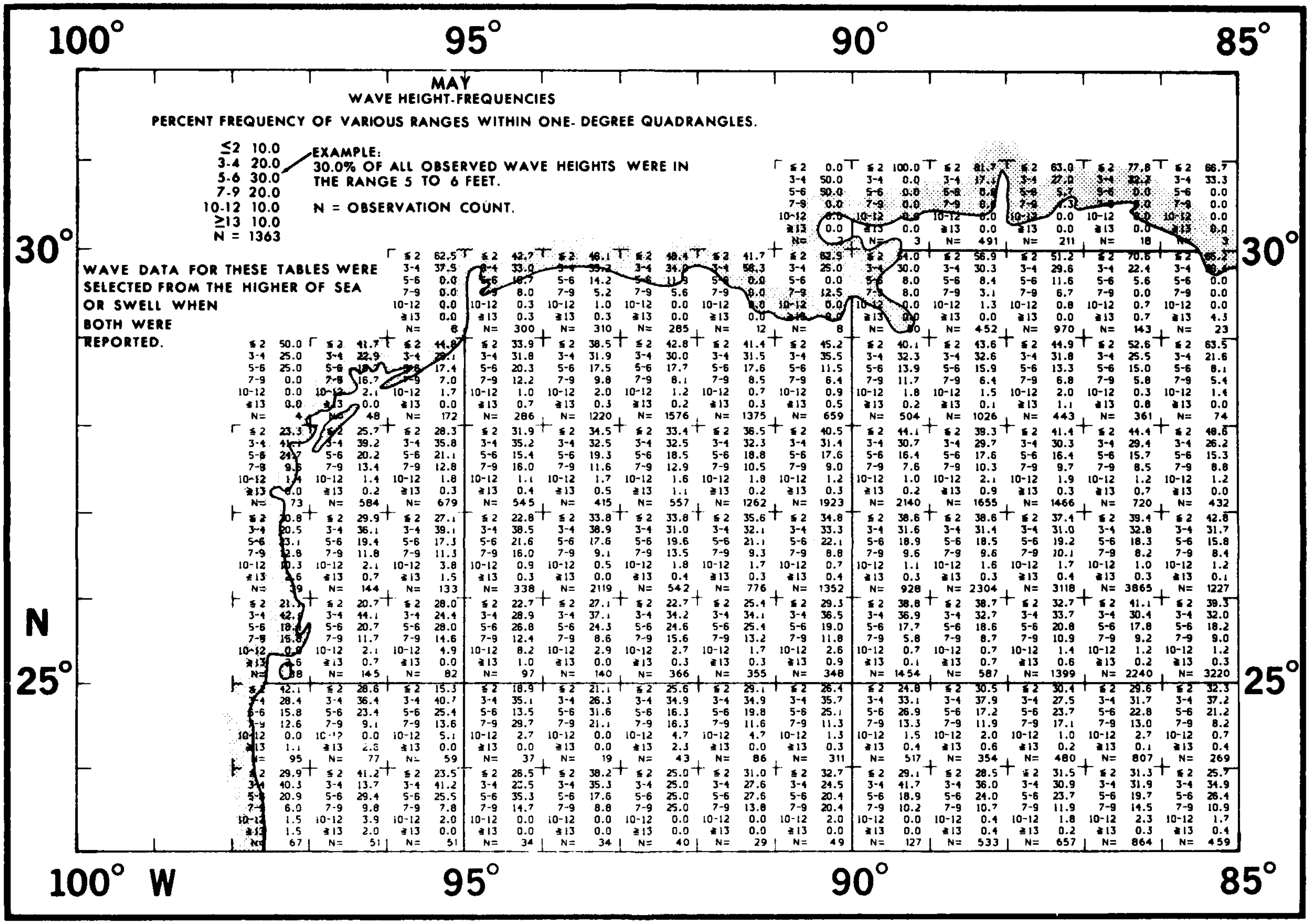
MAY
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM THE NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
100°
95°
90°
85°
30°
25°
N
100° W

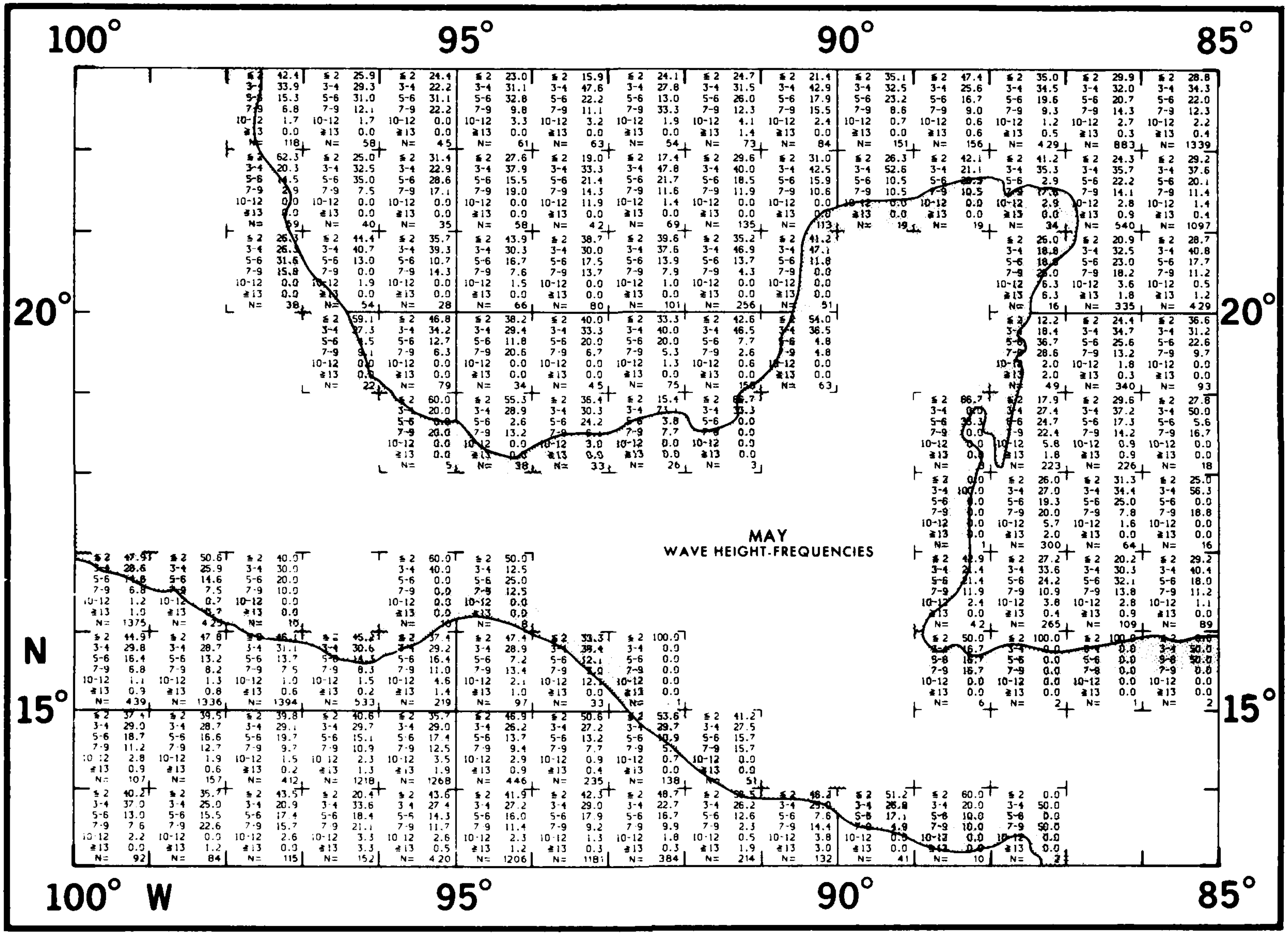

MAY
SURFACE WIND ROSE
85°
90°
95°
100° W
20°
15°
N



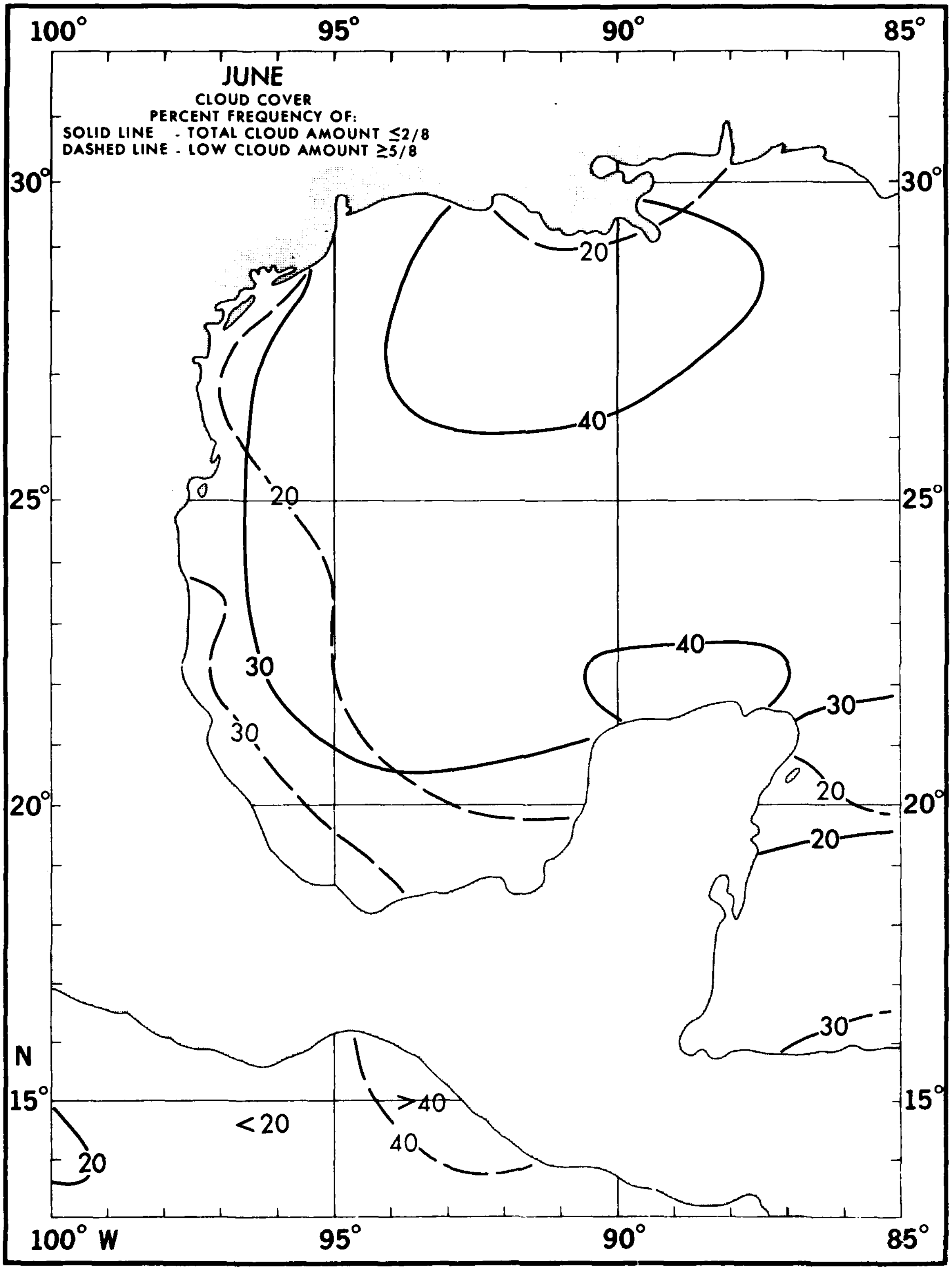
MAY
AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
76
77
78
79
80
81
82
83
84
85
>85


MAY
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
SOLID LINE - WAVE HEIGHT ≥3 FEET
DASHED LINE - WAVE HEIGHT ≥8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS.
SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
30
40
50
60
70
<10
10

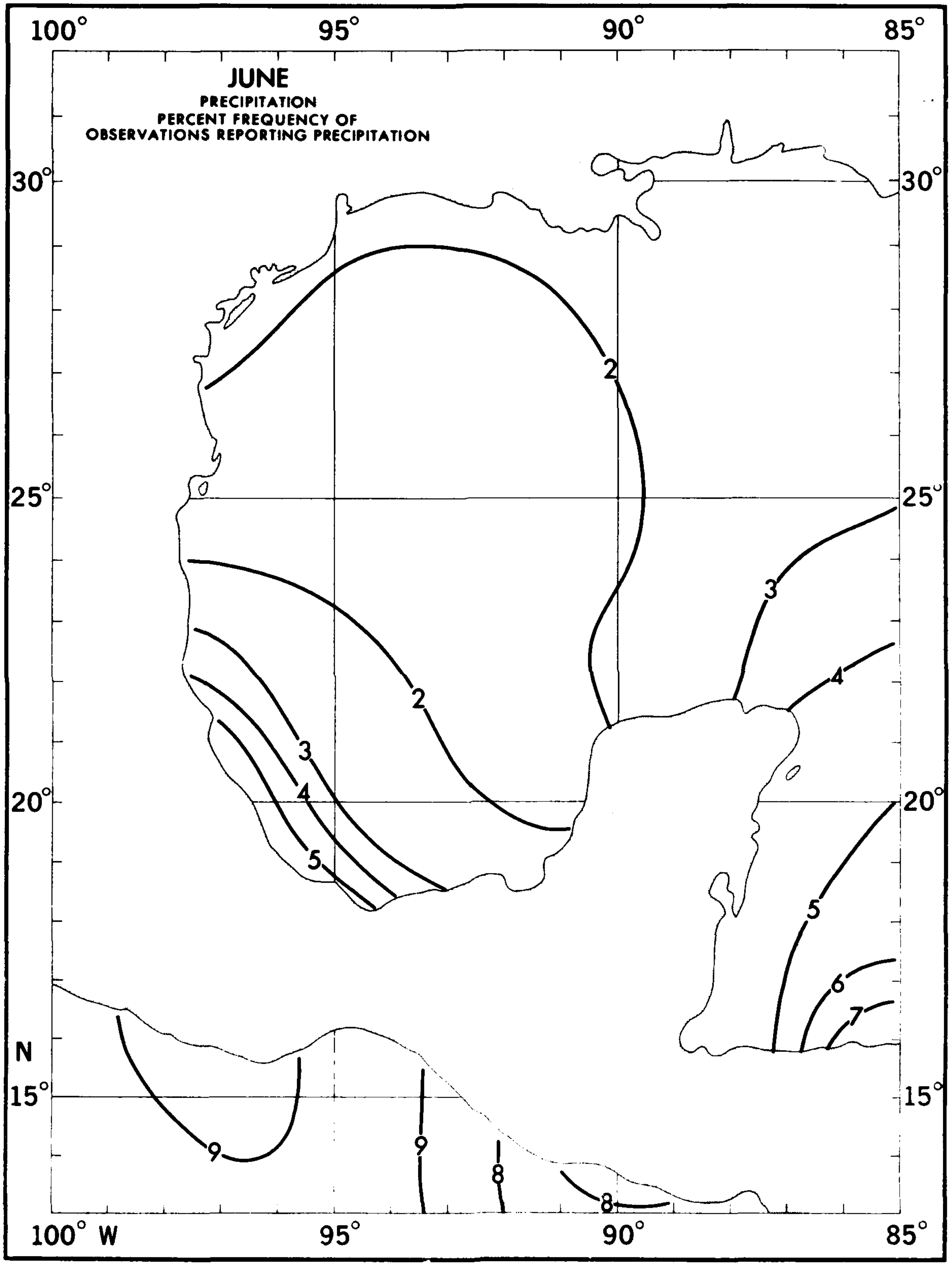

MAY
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
EXAMPLE:
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
100°
95°
90°
85°
30°
25°
N
100° W

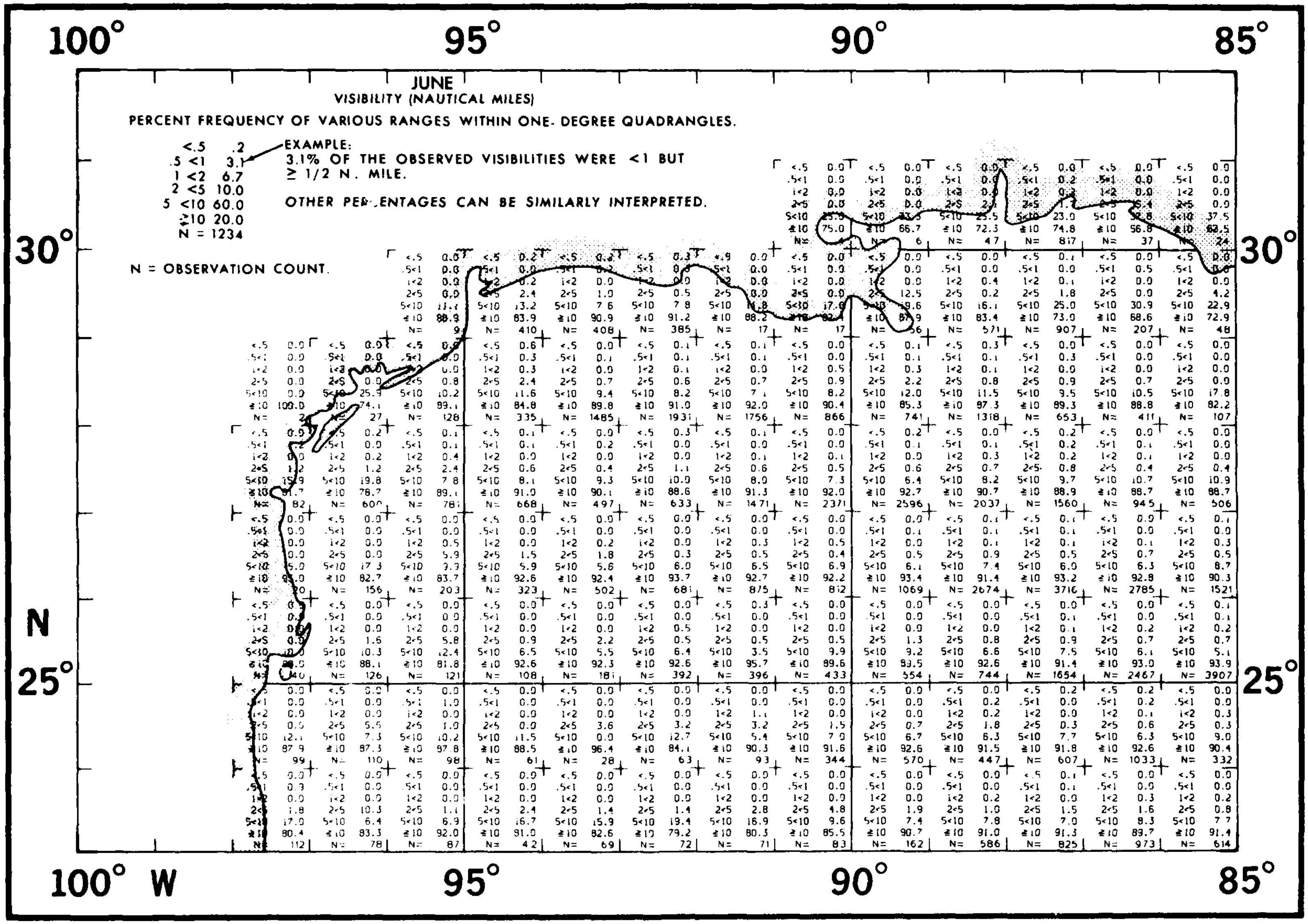


100°
95°
90°
85°
20°
15°
N
100° W
MAY
WAVE HEIGHT-FREQUENCIES

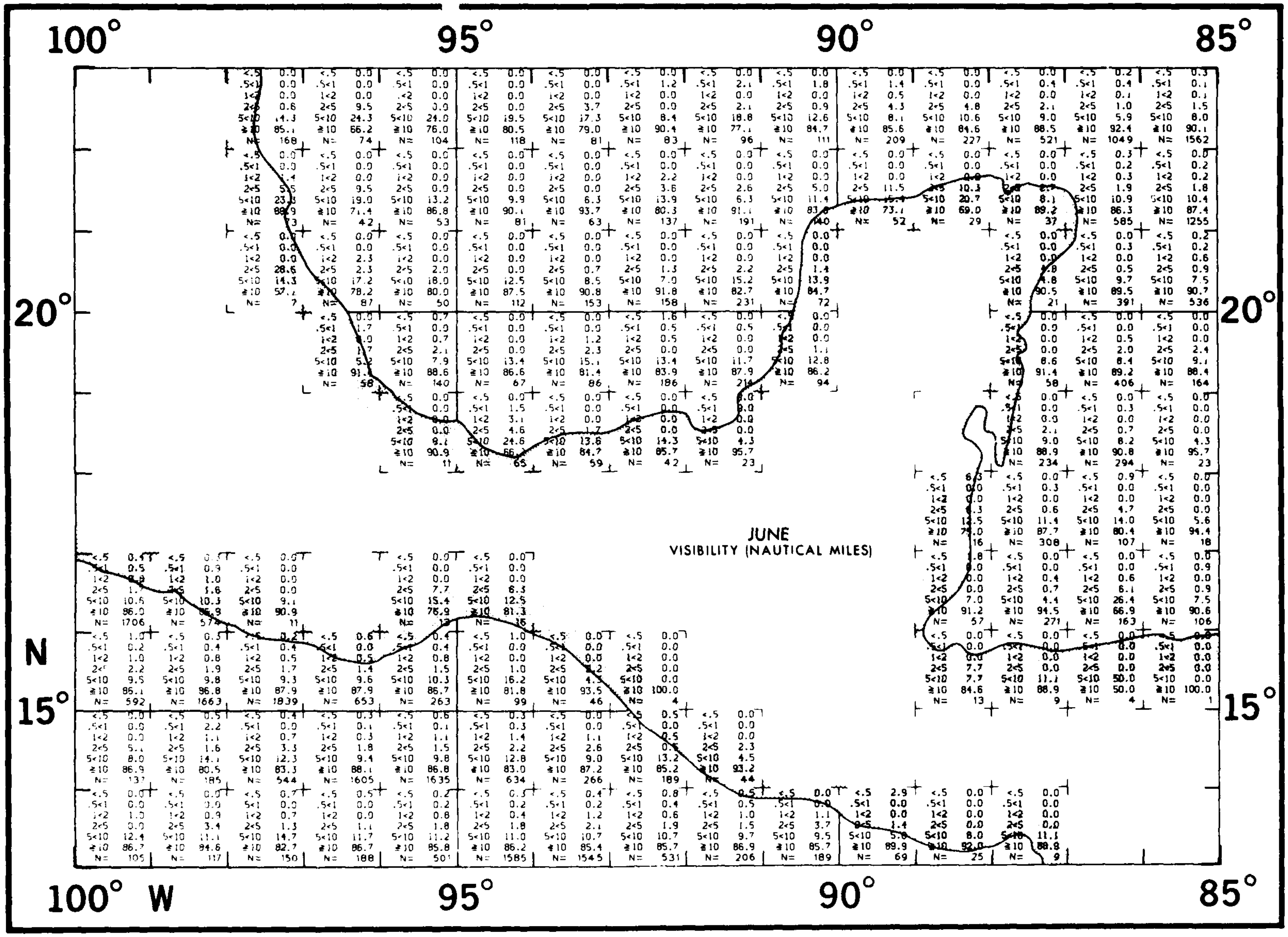


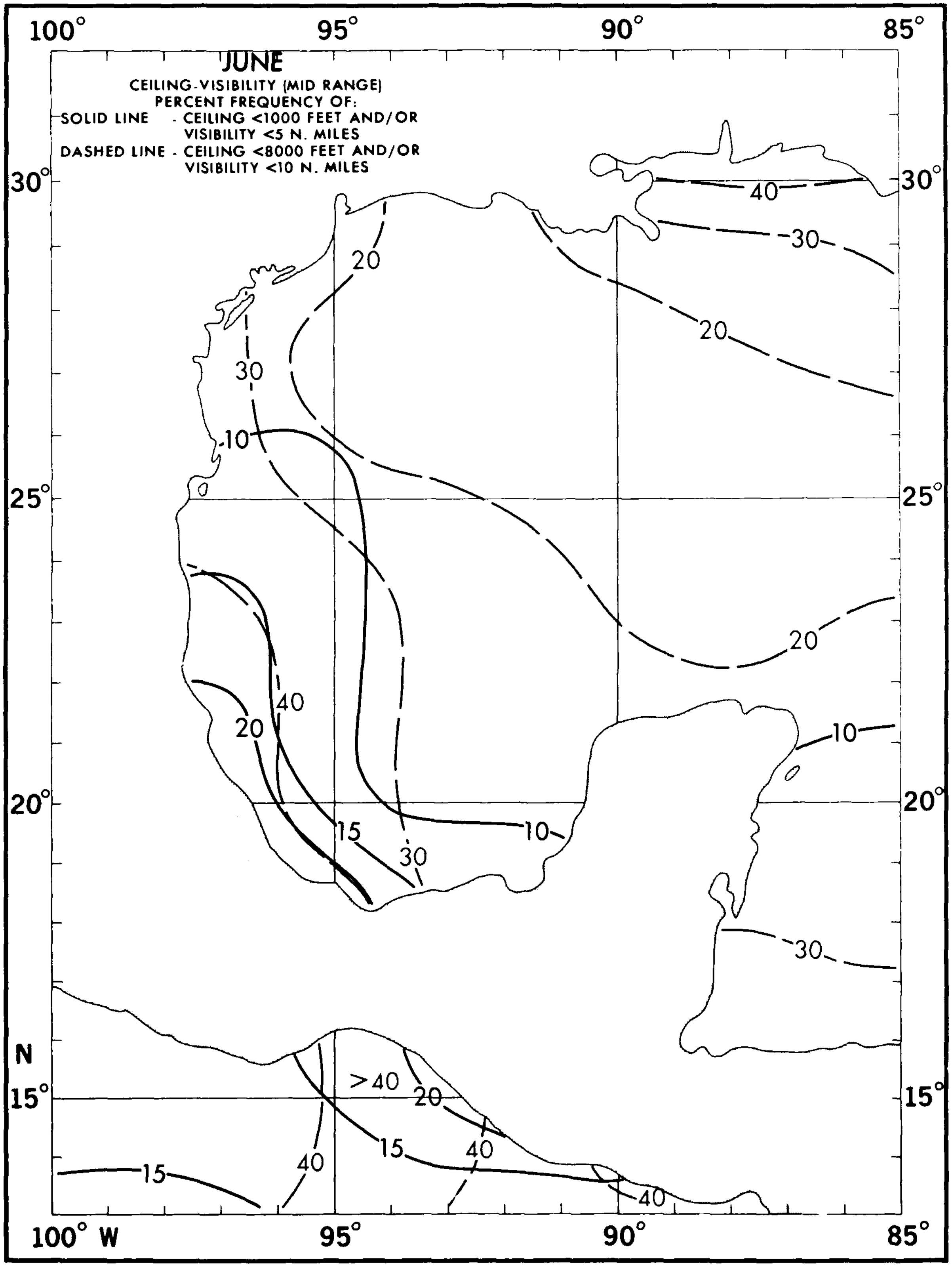
JUNE
CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE - TOTAL CLOUD AMOUNT ≤2/8
DASHED LINE - LOW CLOUD AMOUNT ≥5/8
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
20
40
30
<20
>40


JUNE
PRECIPITATION
PERCENT FREQUENCY OF
OBSERVATIONS REPORTING PRECIPITATION
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
2
3
4
5
6
7
8
9

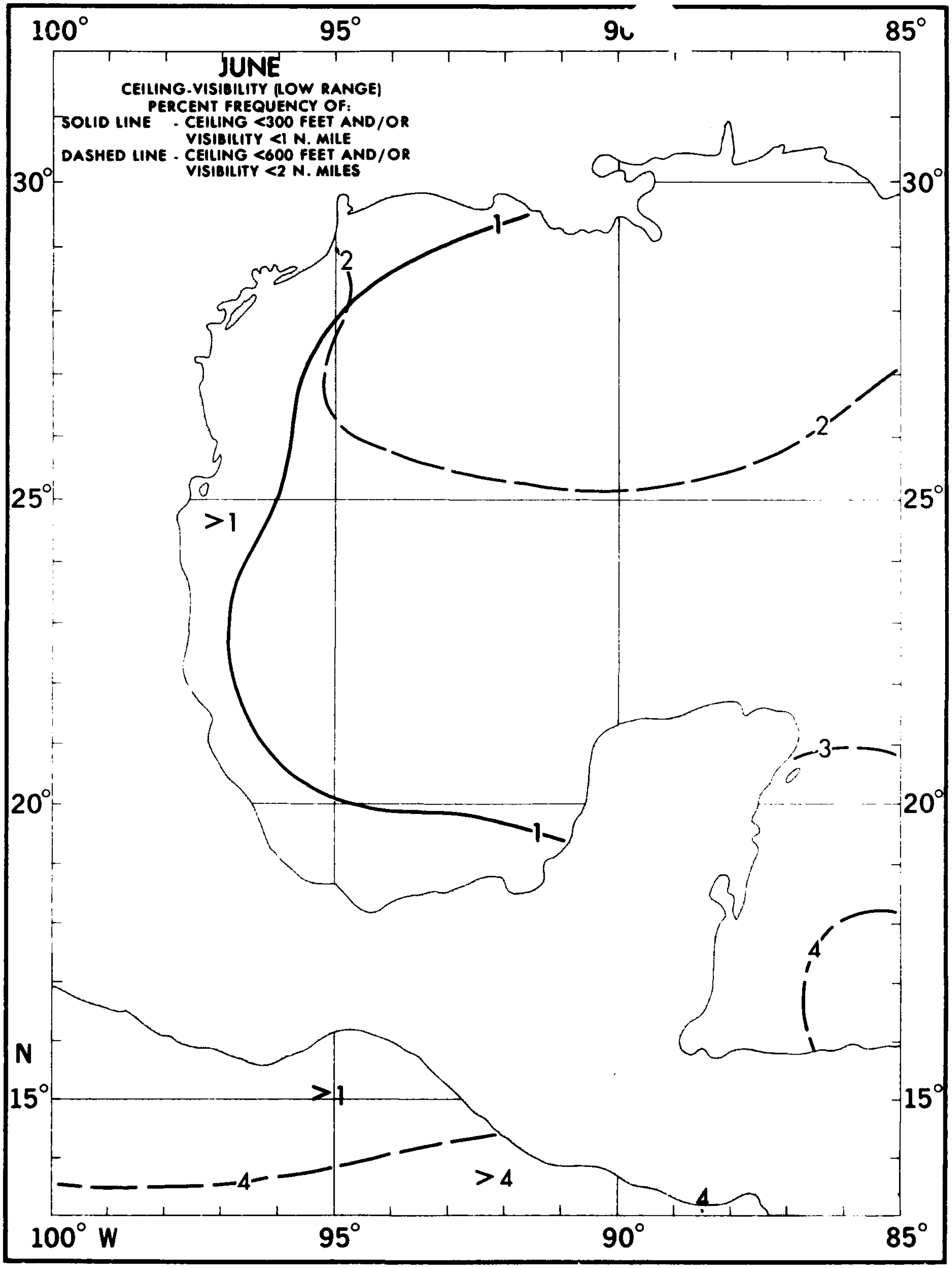


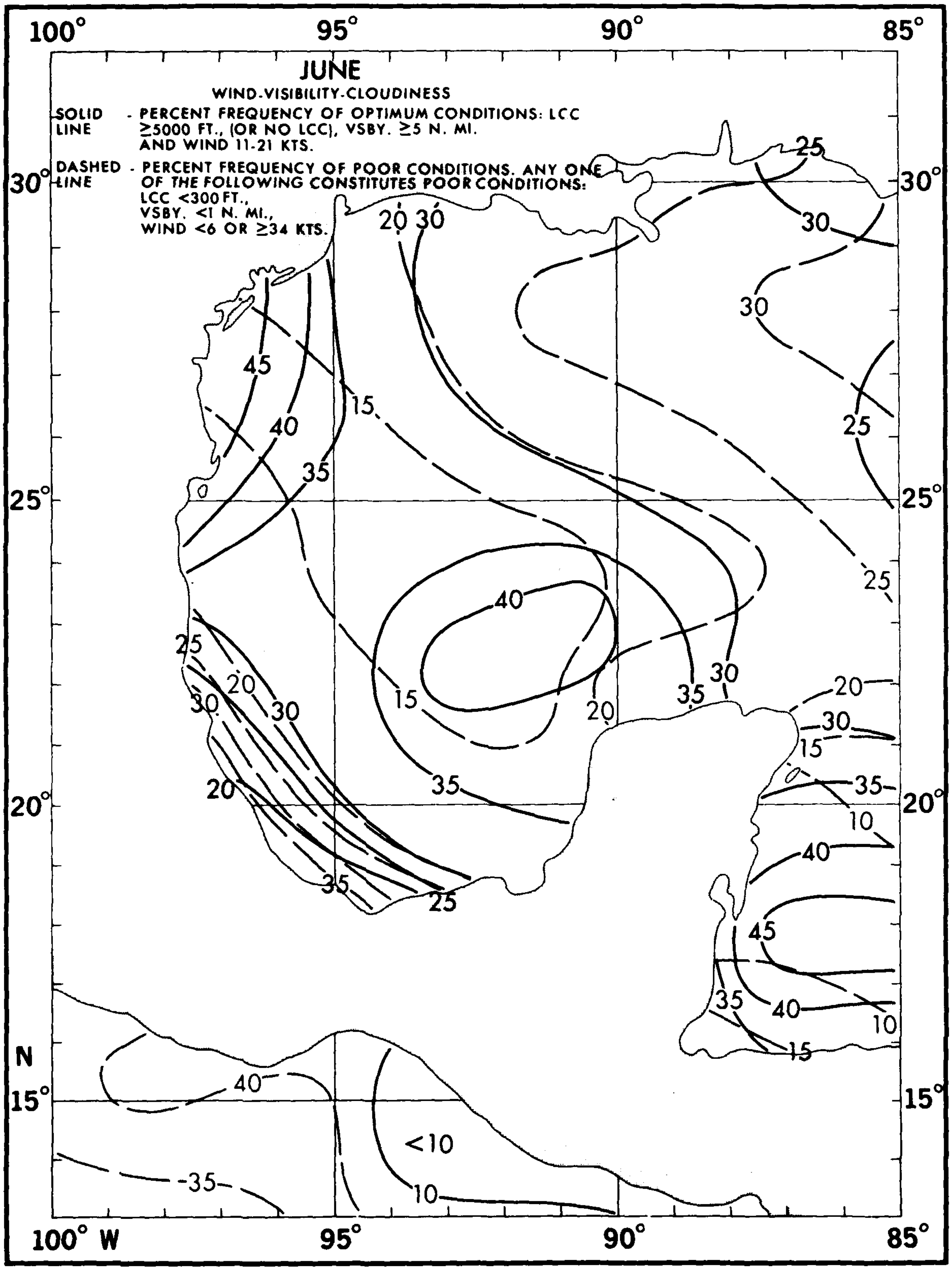
100°
95°
90°
85°
JUNE
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
<.5 .2
.5 <1 3.1
1 <2 6.7
2 <5 10.0
5 <10 60.0
≥10 20.0
N = 1234
EXAMPLE:
3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥ 1/2 N. MILE.
OTHER PERCENTAGES CAN BE SIMILARLY INTERPRETED.
N = OBSERVATION COUNT.
30°
N
25°
100° W
95°
90°
85°

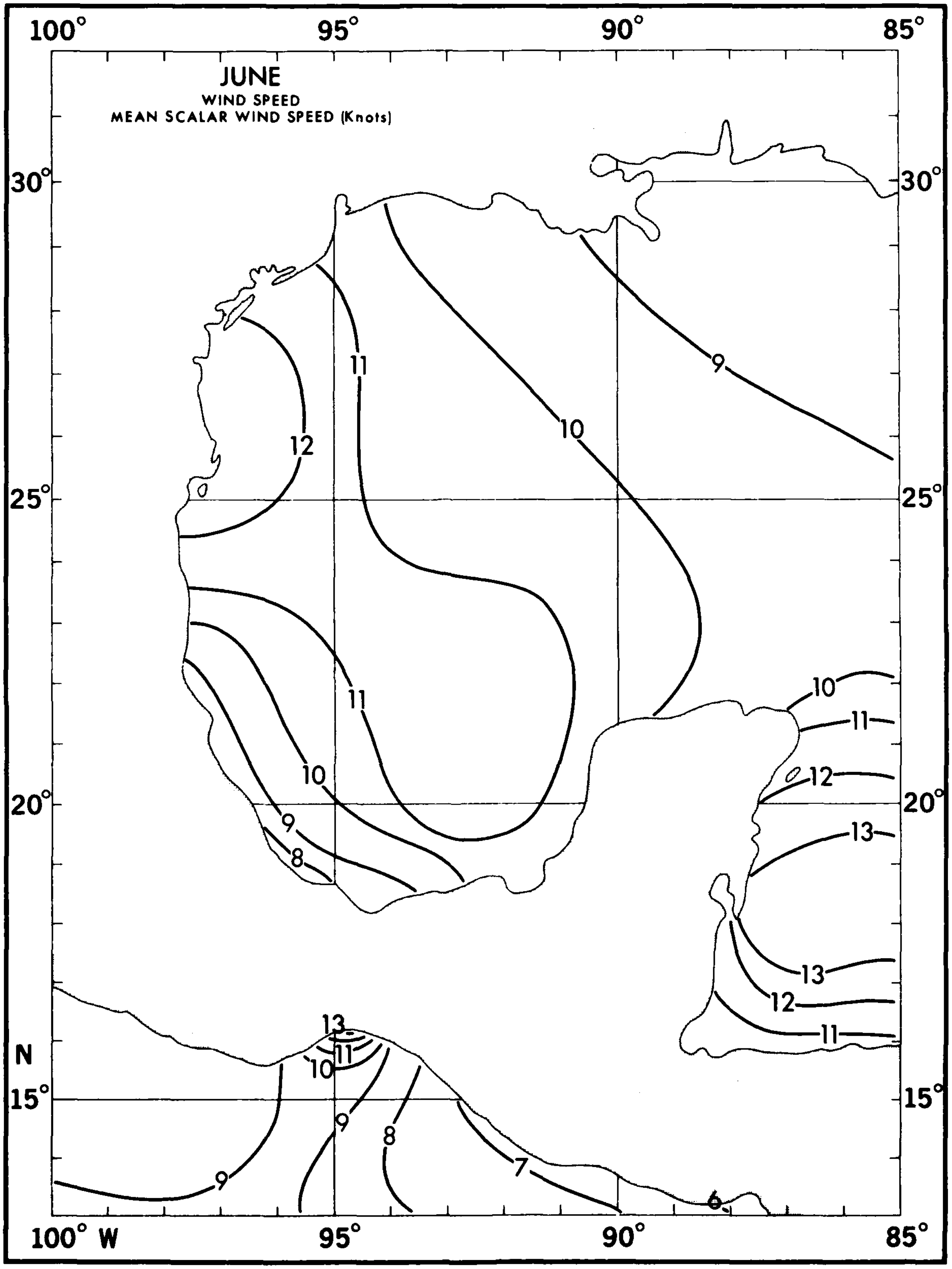

JUNE
VISIBILITY (NAUTICAL MILES)
100°
95°
90°
85°
20°
15°
N
100° W



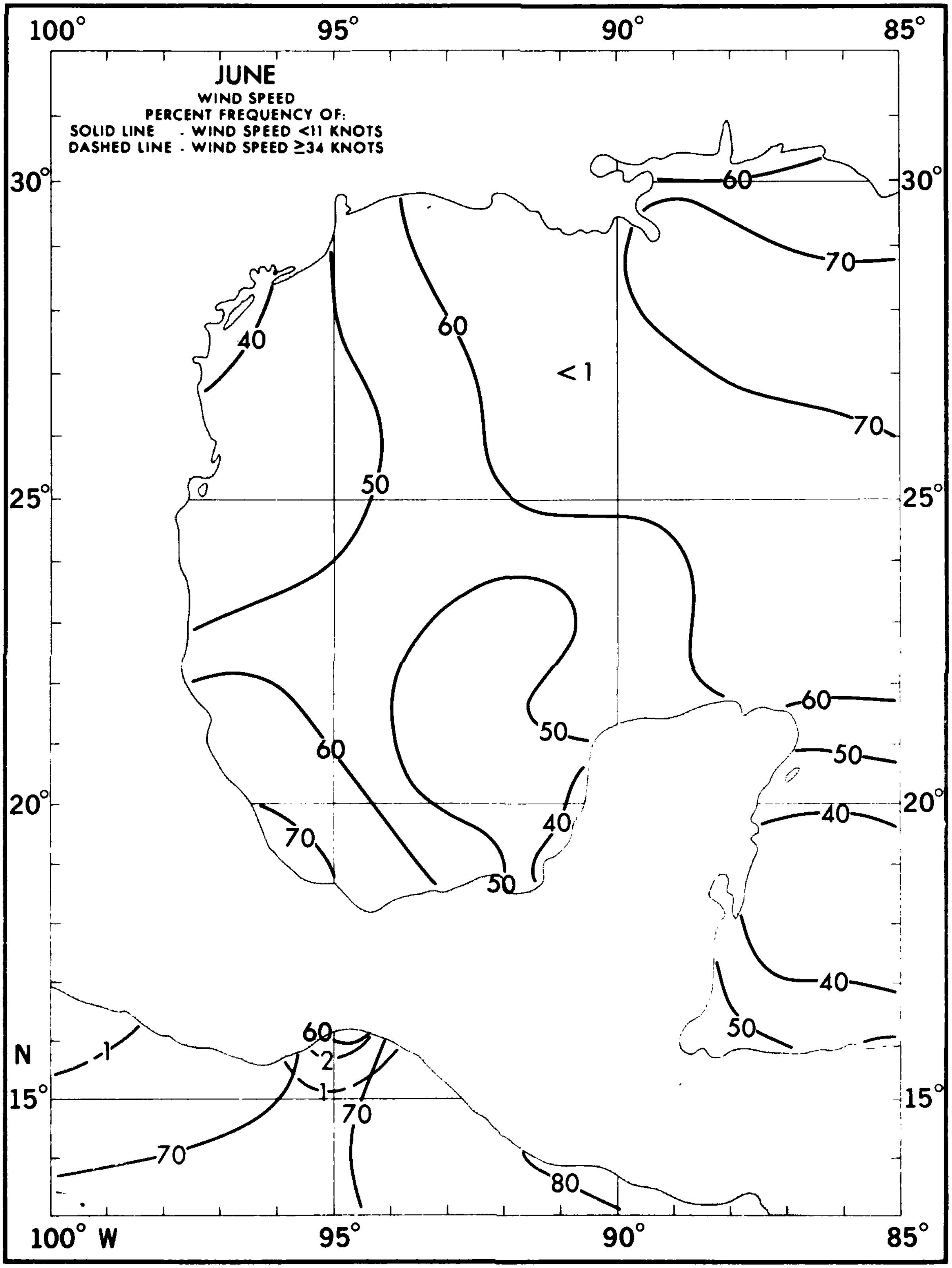
JUNE
CEILING-VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES
DASHED LINE - CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
40
30
20
10
15
>40

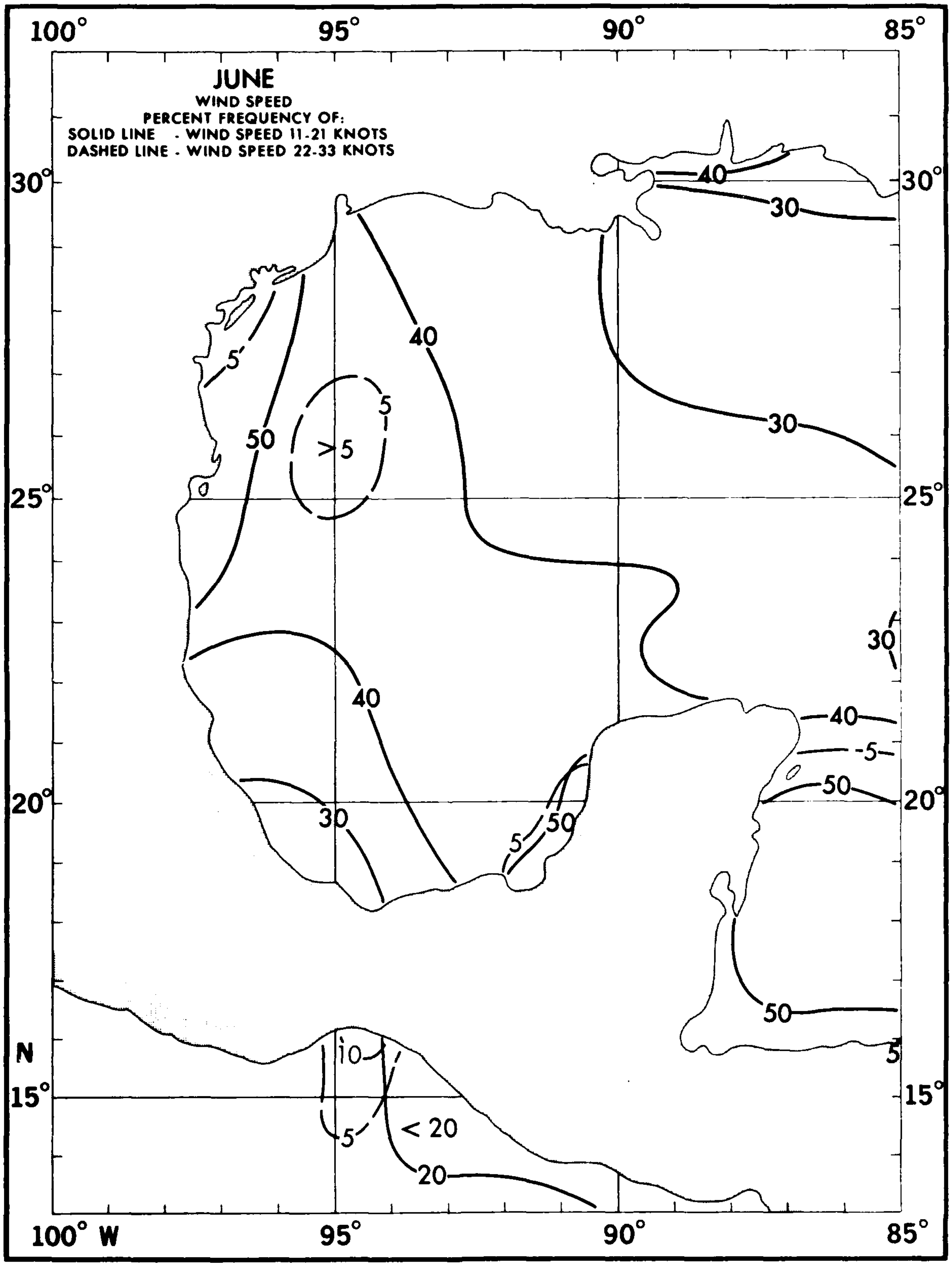

JUNE
CEILING-VISIBILITY (LOW RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <300 FEET AND/OR VISIBILITY <1 N. MILE
DASHED LINE - CEILING <600 FEET AND/OR VISIBILITY <2 N. MILES
100°
95°
85°
30°
25°
20°
15°
N
100° W
95°
90°
85°
1
2
3
4
>1
>4

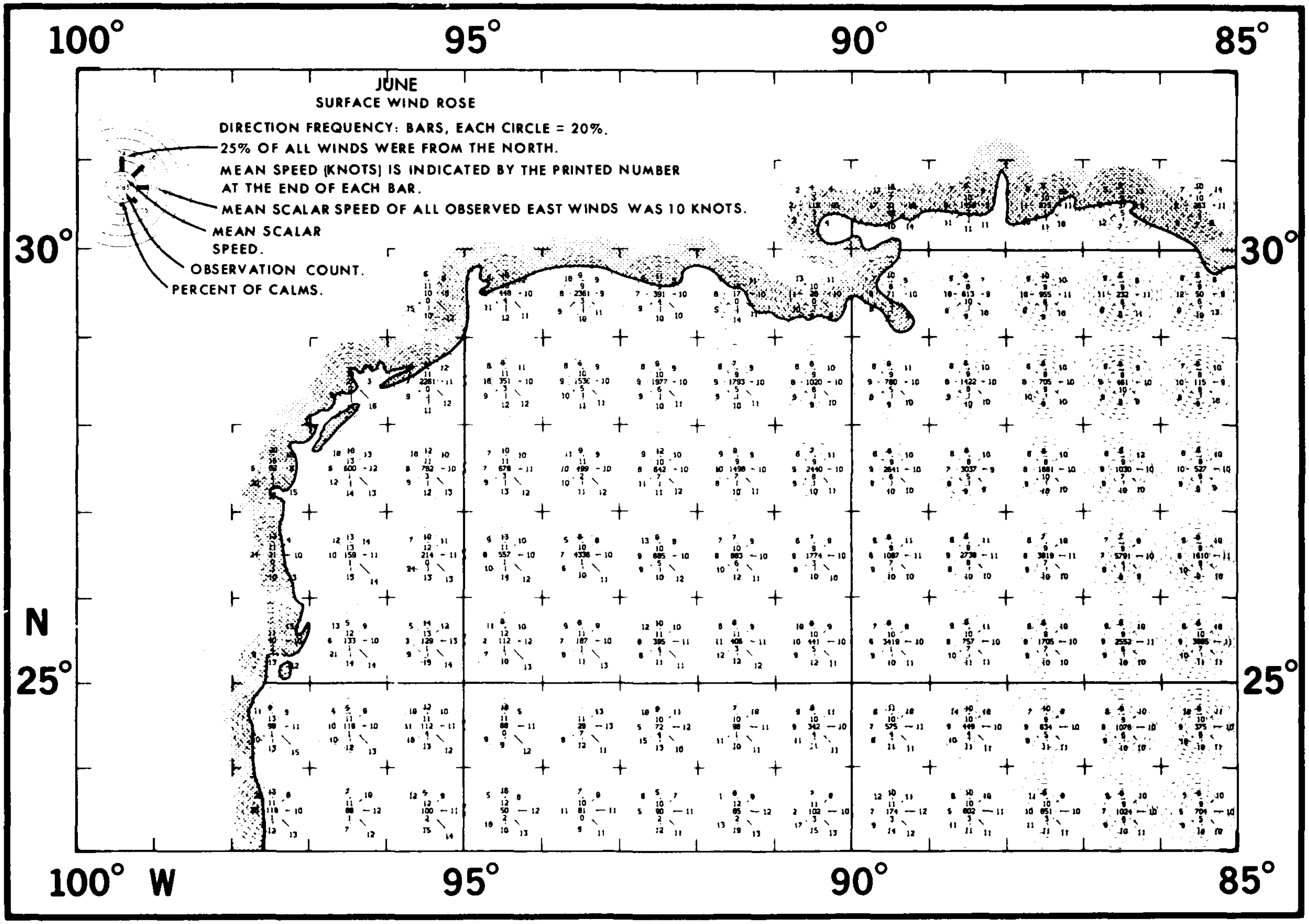

JUNE
WIND-VISIBILITY-CLOUDINESS
SOLID LINE - PERCENT FREQUENCY OF OPTIMUM CONDITIONS: LCC ≥5000 FT., (OR NO LCC), VSBY. ≥5 N. MI. AND WIND 11-21 KTS.
DASHED LINE - PERCENT FREQUENCY OF POOR CONDITIONS. ANY ONE OF THE FOLLOWING CONSTITUTES POOR CONDITIONS: LCC <300 FT., VSBY. <1 N. MI., WIND <6 OR ≥34 KTS.
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
<10

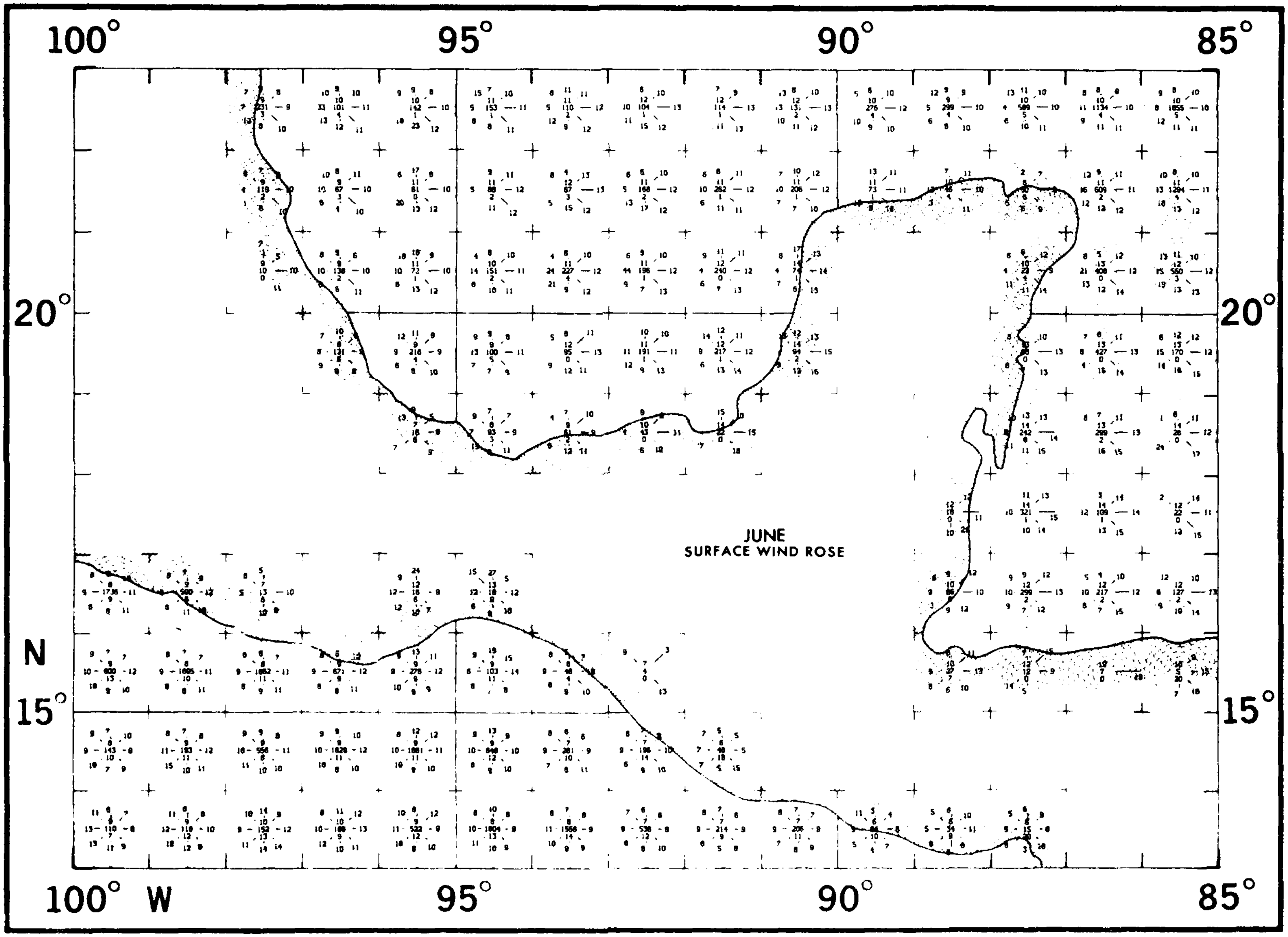


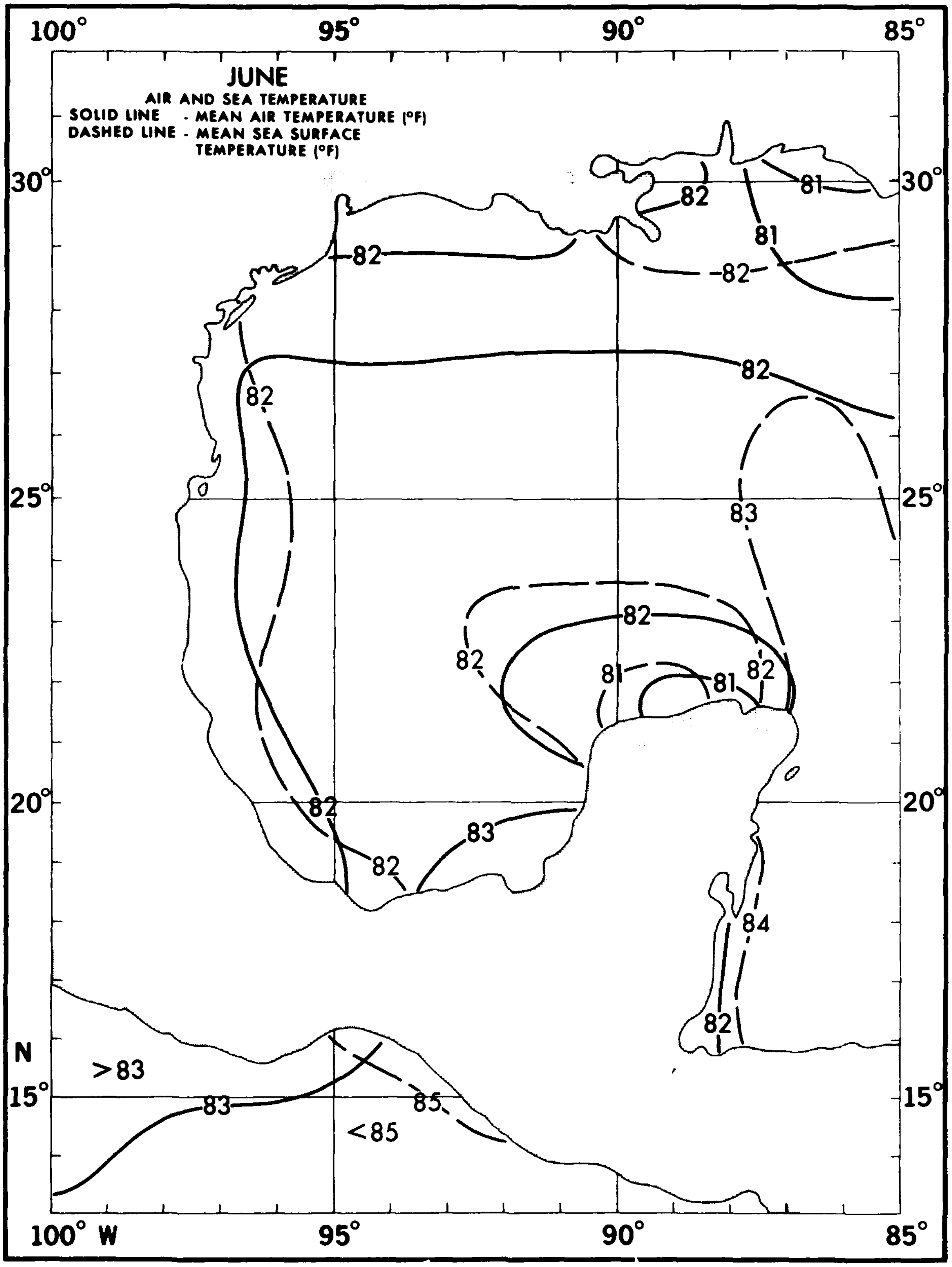
JUNE
WIND SPEED
MEAN SCALAR WIND SPEED (Knots)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
9
10
11
12
13
8
7
6

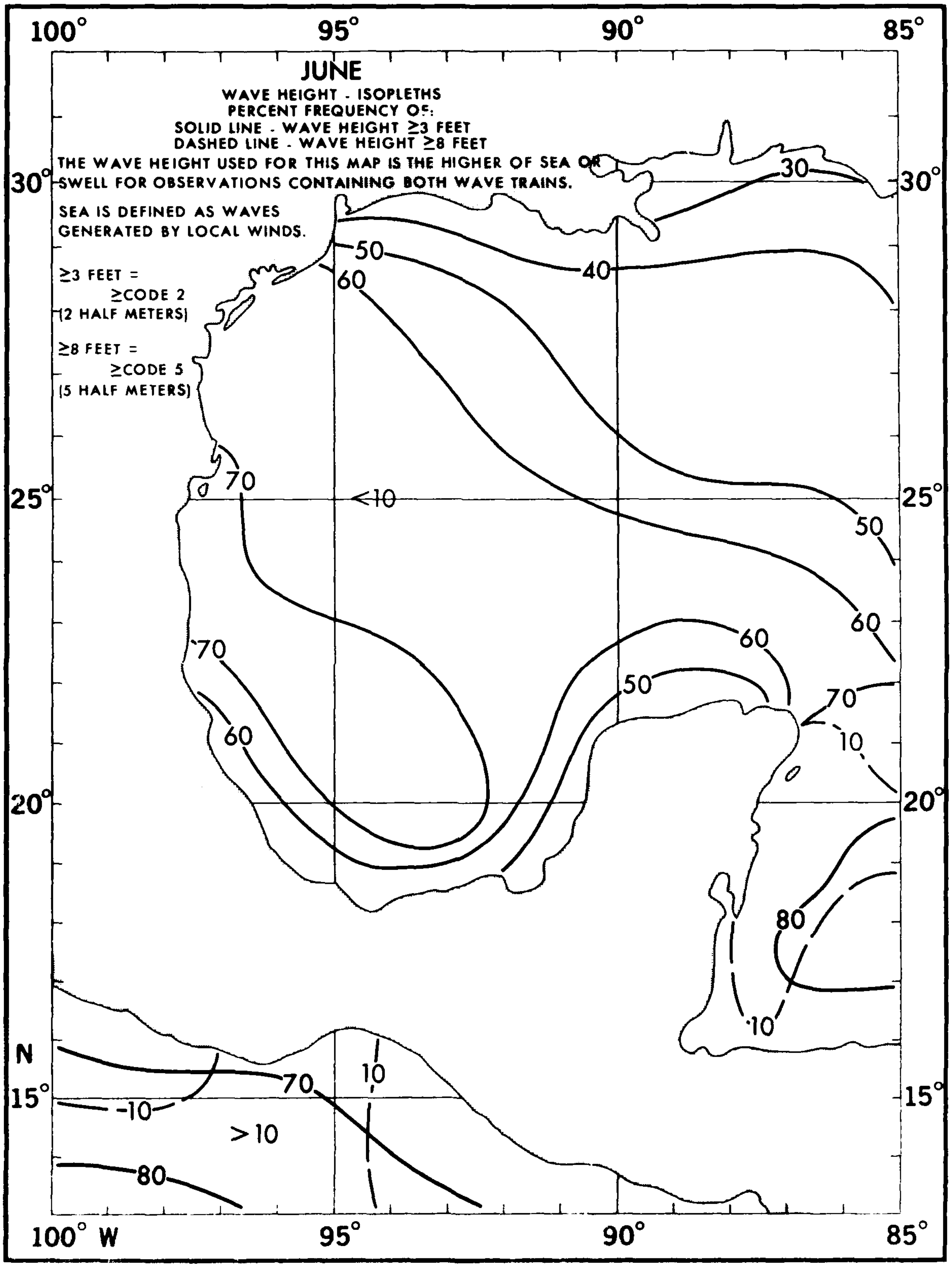

JUNE
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED <11 KNOTS
DASHED LINE - WIND SPEED ≥34 KNOTS
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
<1
40
50
60
70
80
1
2


JUNE
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED 11-21 KNOTS
DASHED LINE - WIND SPEED 22-33 KNOTS
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
40
30
50
5
>5
10
< 20
20

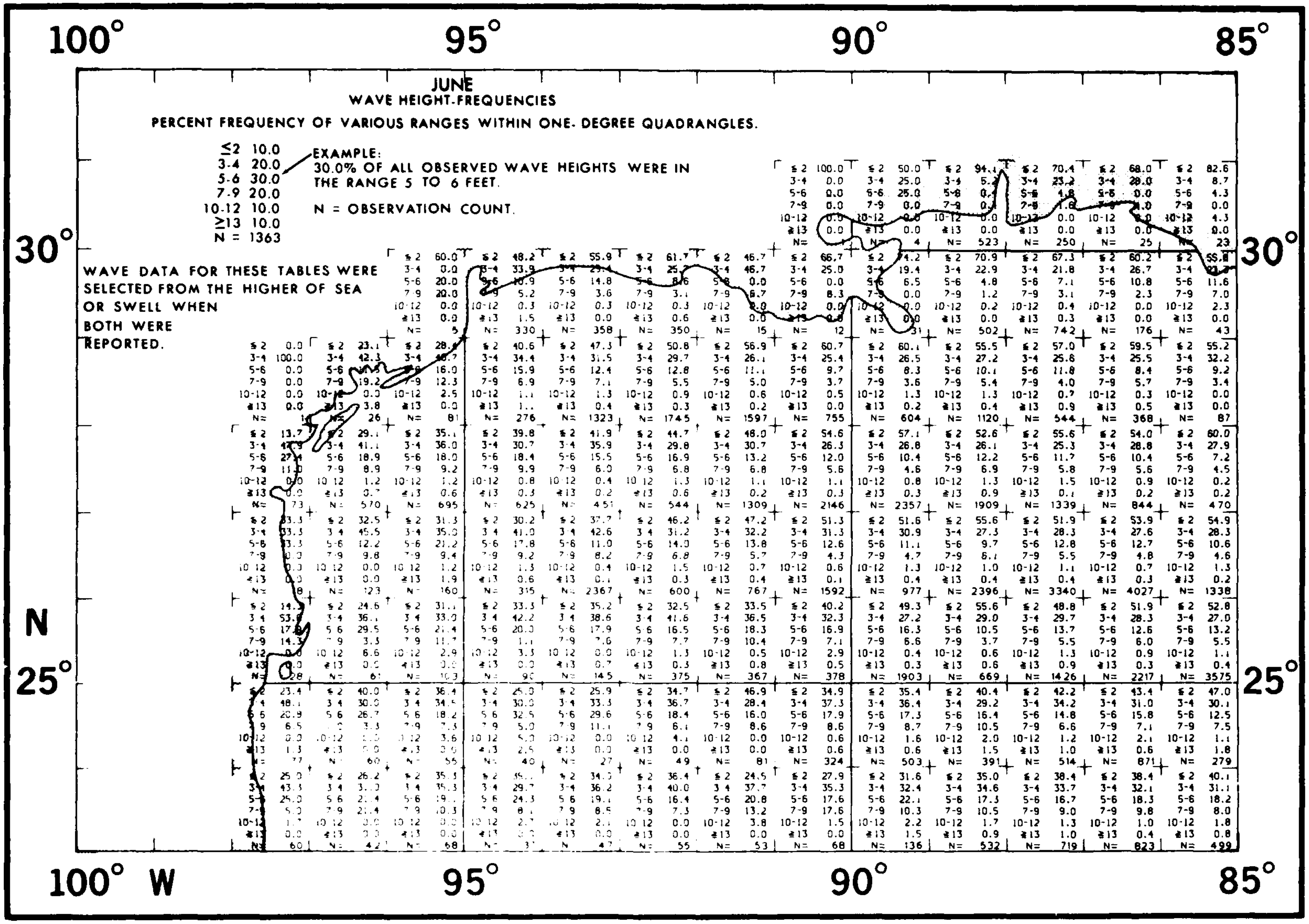

JUNE
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM THE NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
100°
95°
90°
85°
30°
25°
N
100° W

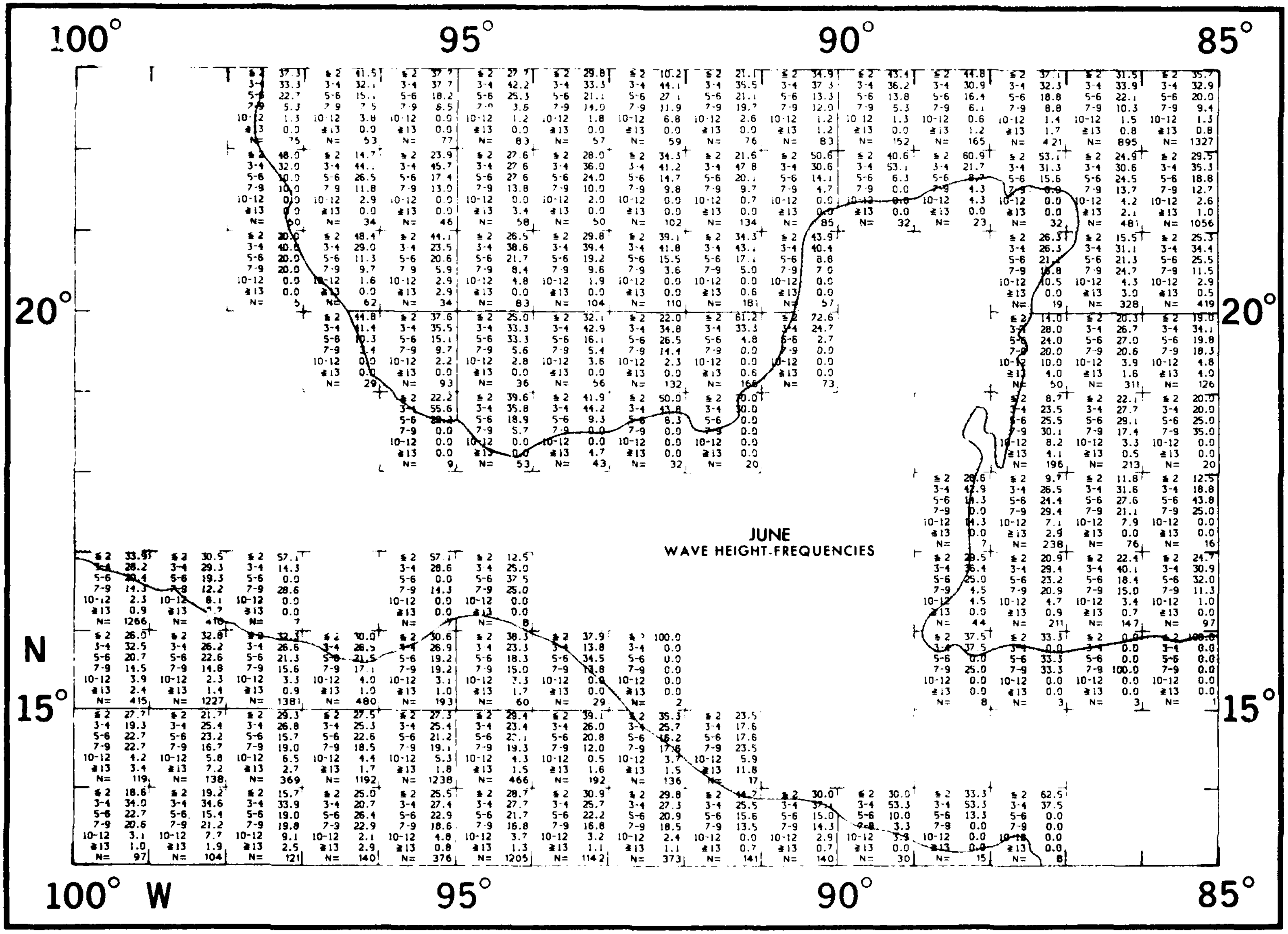

JUNE
SURFACE WIND ROSE
100°
95°
90°
85°
100° W
20°
15°
N

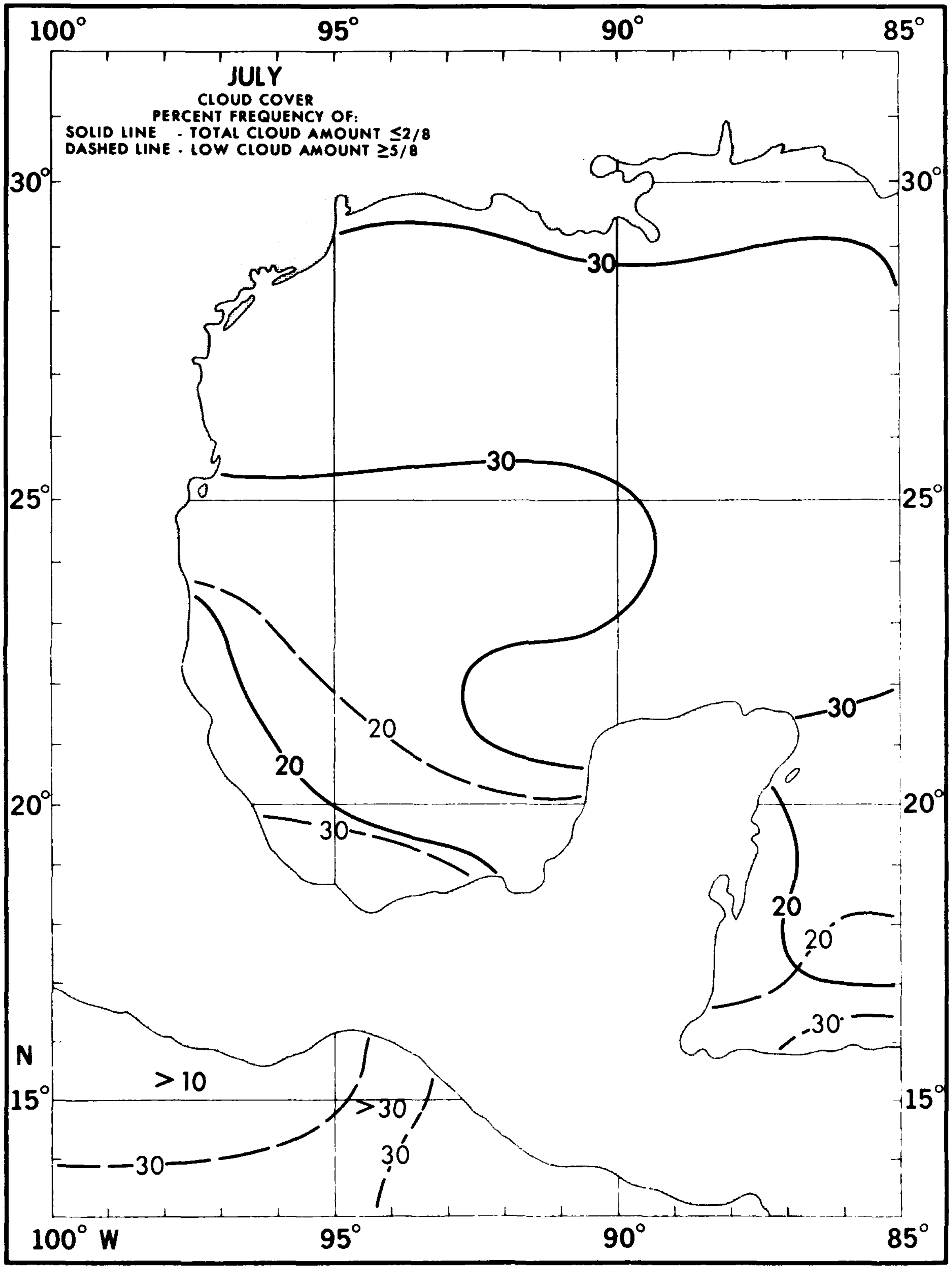

JUNE
AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
82
81
83
84
85
>83
<85

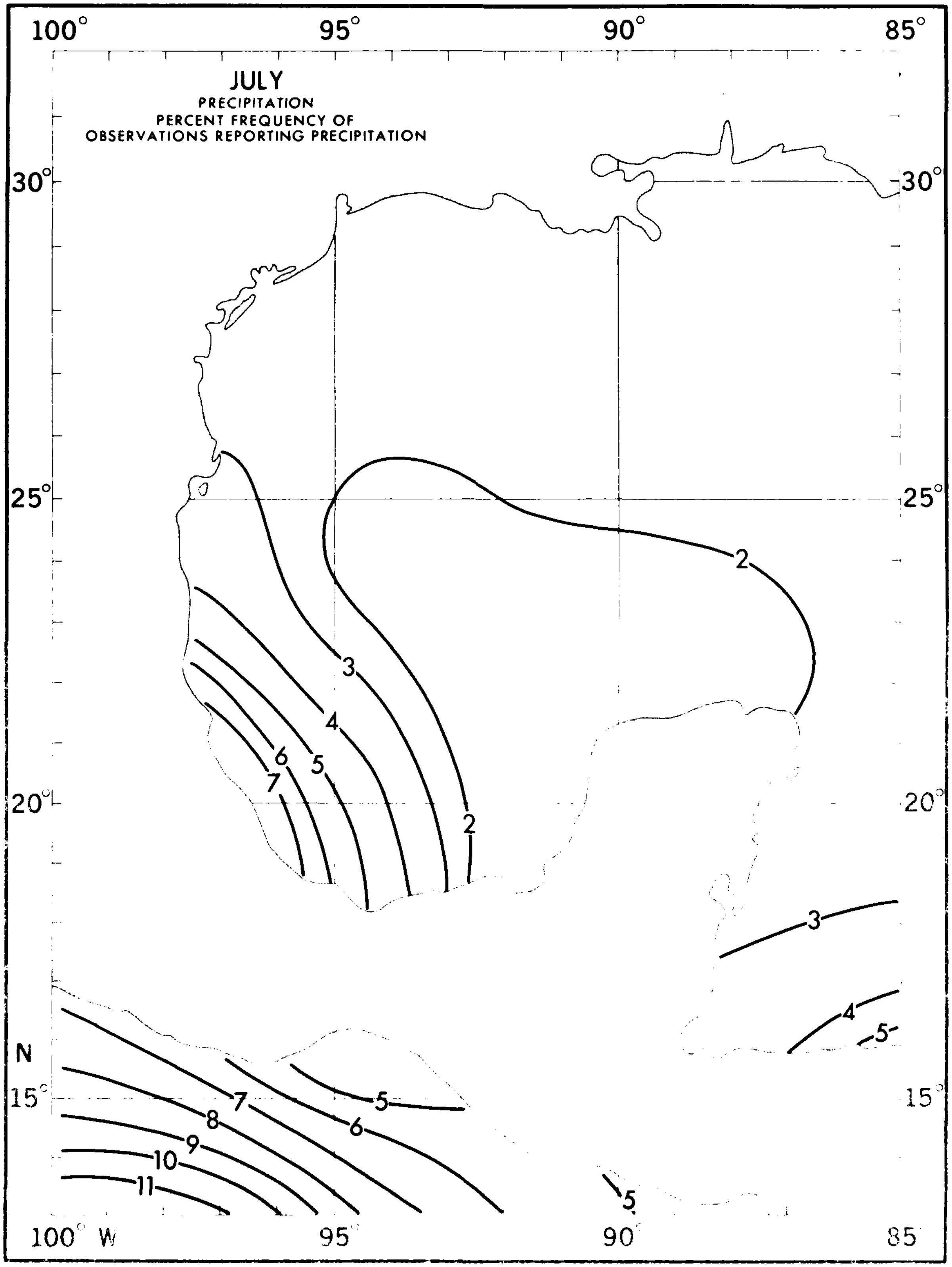


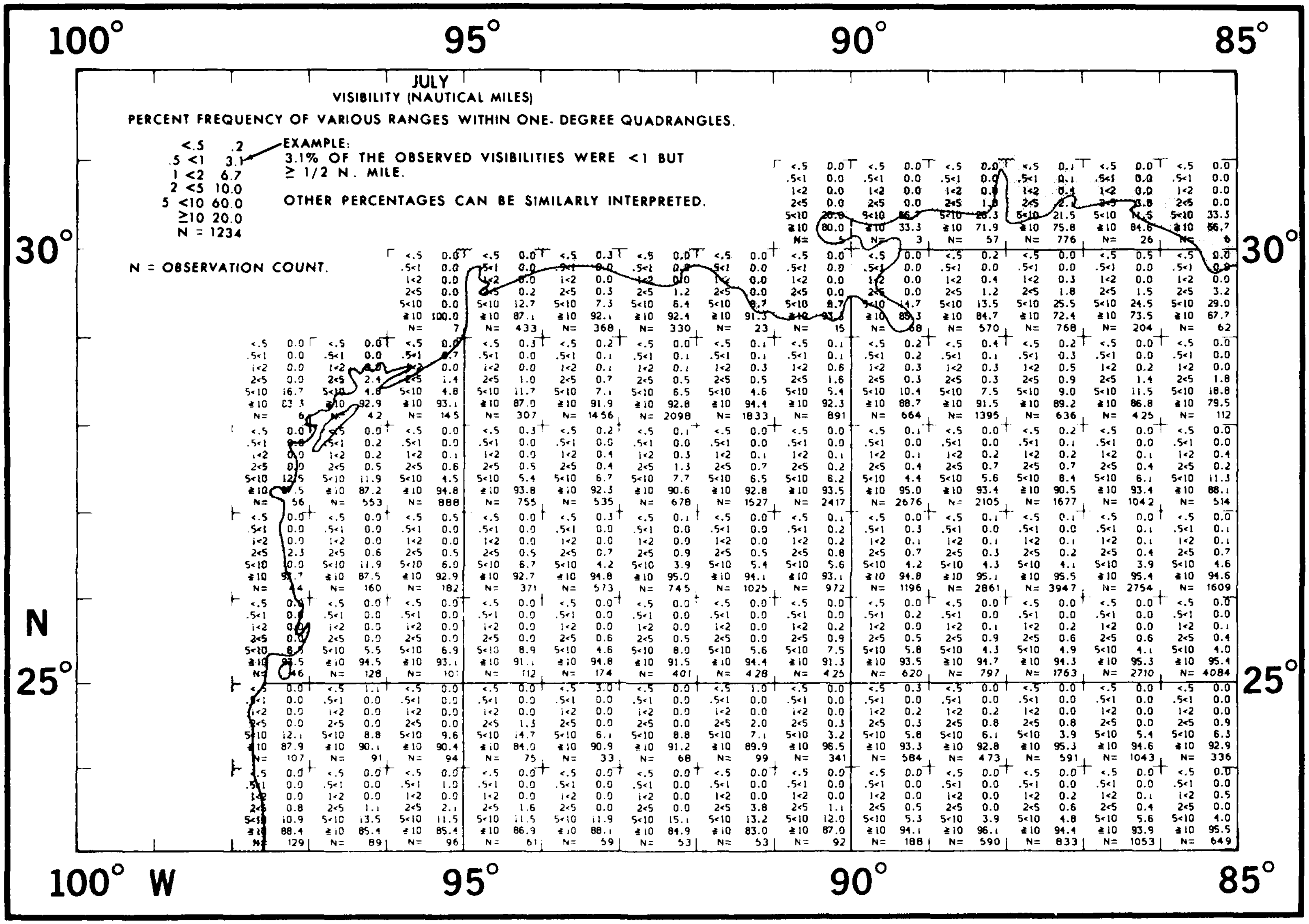
100°
95°
90°
85°
JUNE
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
SOLID LINE - WAVE HEIGHT ≥3 FEET
DASHED LINE - WAVE HEIGHT ≥8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS.
SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
30°
25°
20°
15°
N
30
40
50
60
70
<10
50
60
60
70
50
60
70
10
80
10
70
10
-10
>10
80
100° W
95°
90°
85°

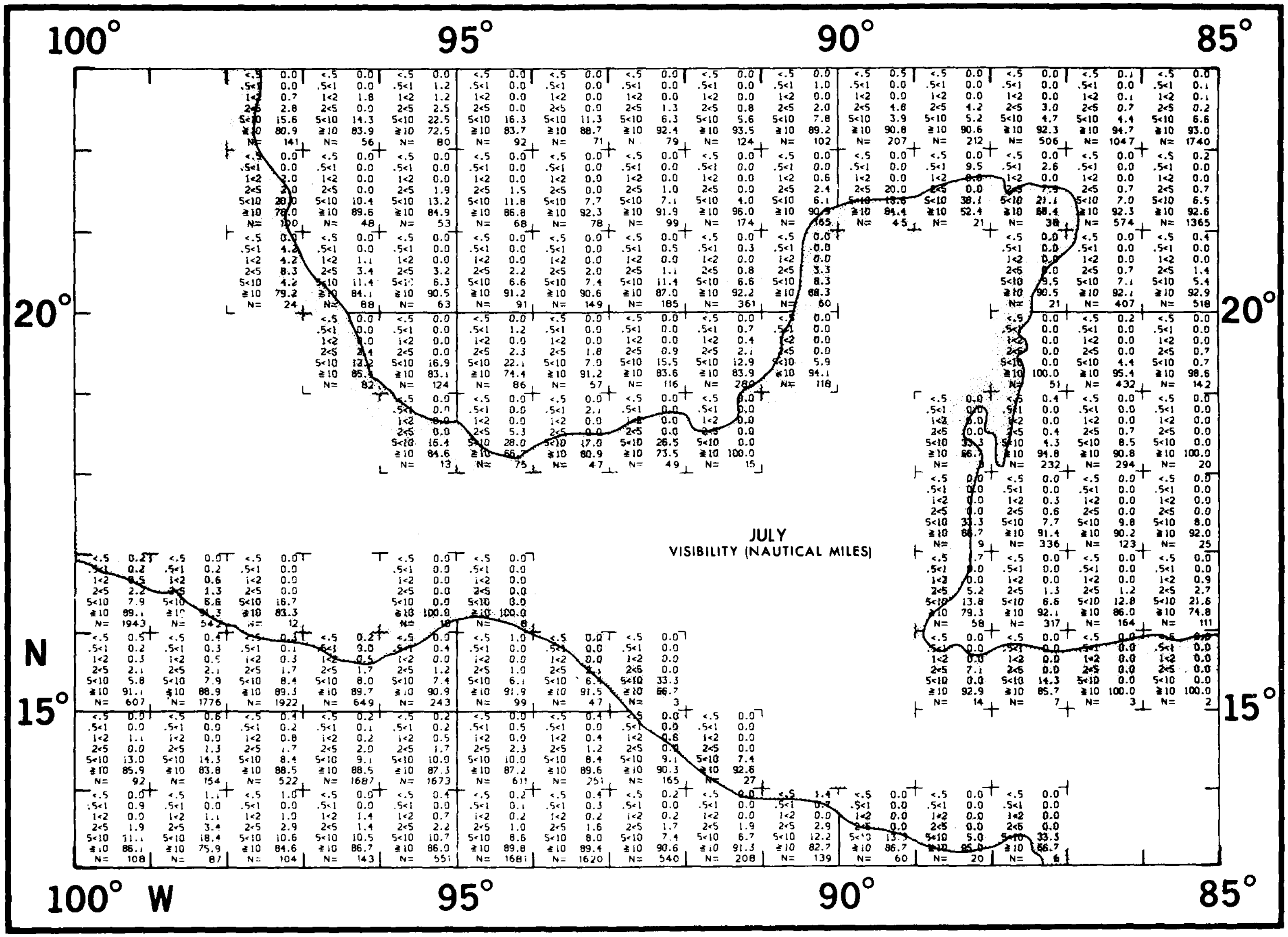

JUNE
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
EXAMPLE:
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
100°
95°
90°
85°
30°
25°
N
100° W

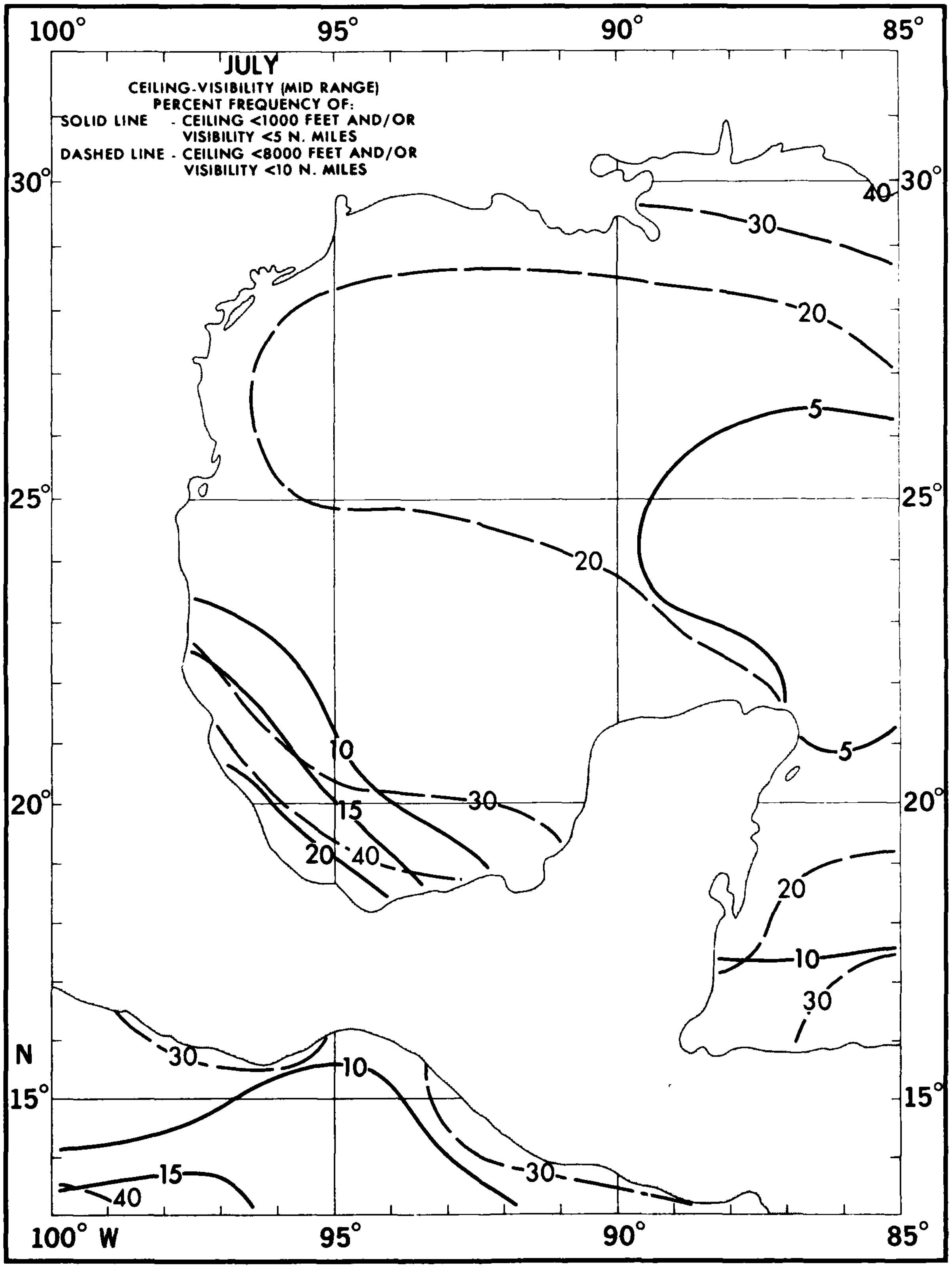

JUNE
WAVE HEIGHT-FREQUENCIES
100°
95°
90°
85°
20°
15°
N
W


JULY
CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE - TOTAL CLOUD AMOUNT ≤2/8
DASHED LINE - LOW CLOUD AMOUNT ≥5/8
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
30
30
30
20
20
30
20
20
30
>10
>30
30
30

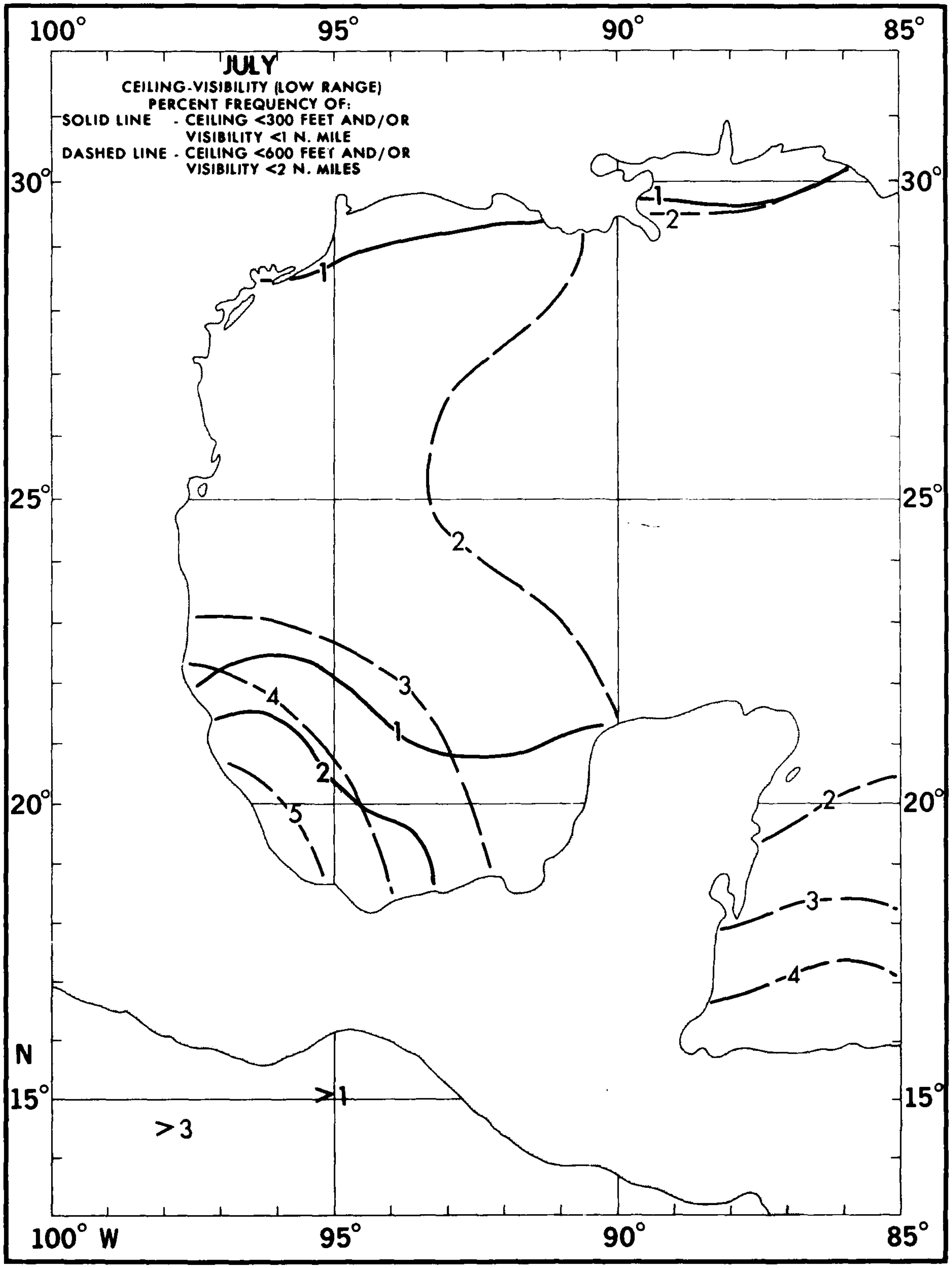

JULY
PRECIPITATION
PERCENT FREQUENCY OF
OBSERVATIONS REPORTING PRECIPITATION
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
2
3
4
5
6
7
8
9
10
11

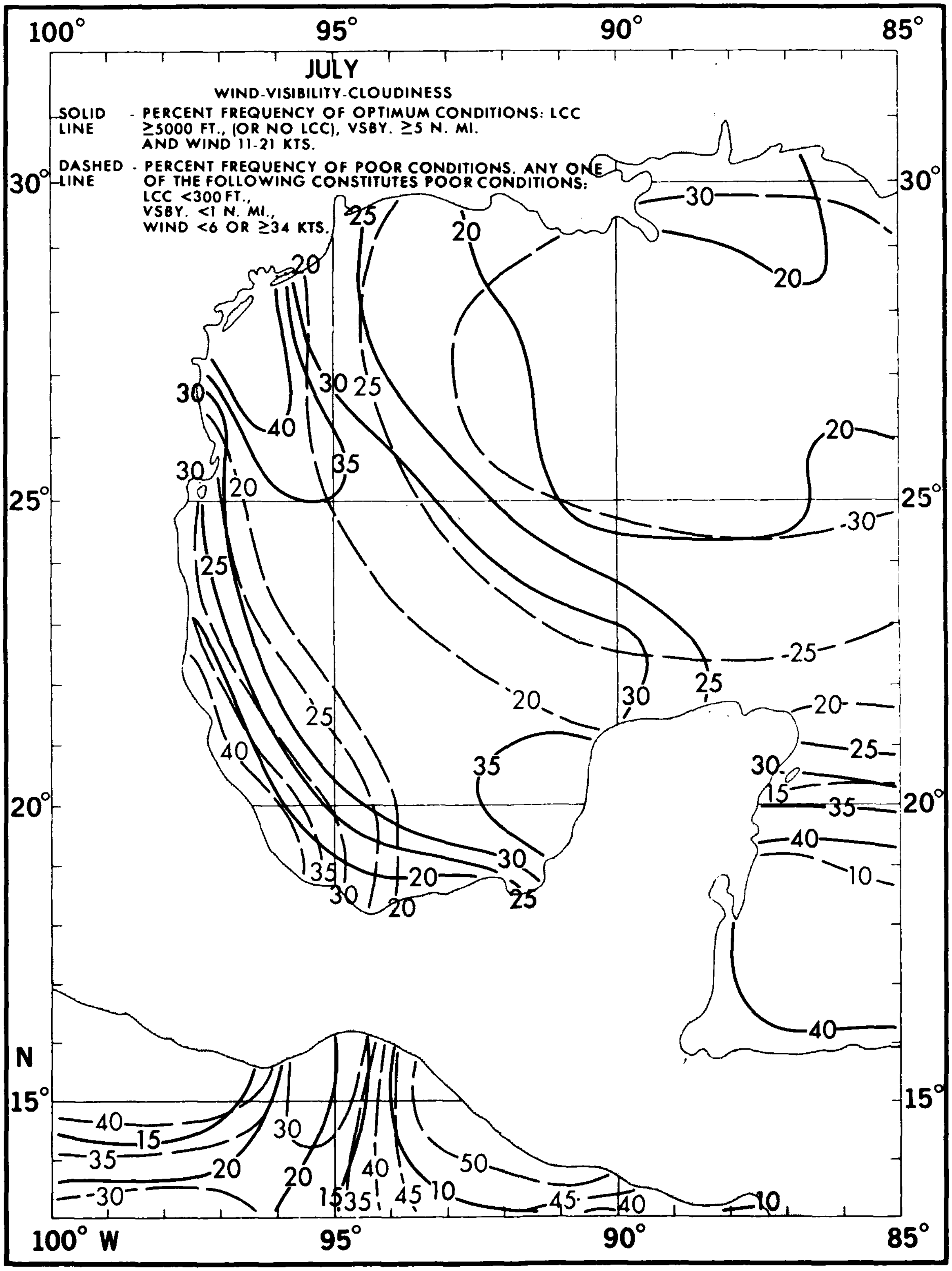

JULY
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE- DEGREE QUADRANGLES.
<.5 .2
.5 <1 3.1
1 <2 6.7
2 <5 10.0
5 <10 60.0
≥10 20.0
N = 1234
EXAMPLE:
3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥ 1/2 N. MILE.
OTHER PERCENTAGES CAN BE SIMILARLY INTERPRETED.
N = OBSERVATION COUNT.
100°
95°
90°
85°
30°
25°
N
100° W


JULY
VISIBILITY (NAUTICAL MILES)
100°
95°
90°
85°
20°
15°
N
100° W

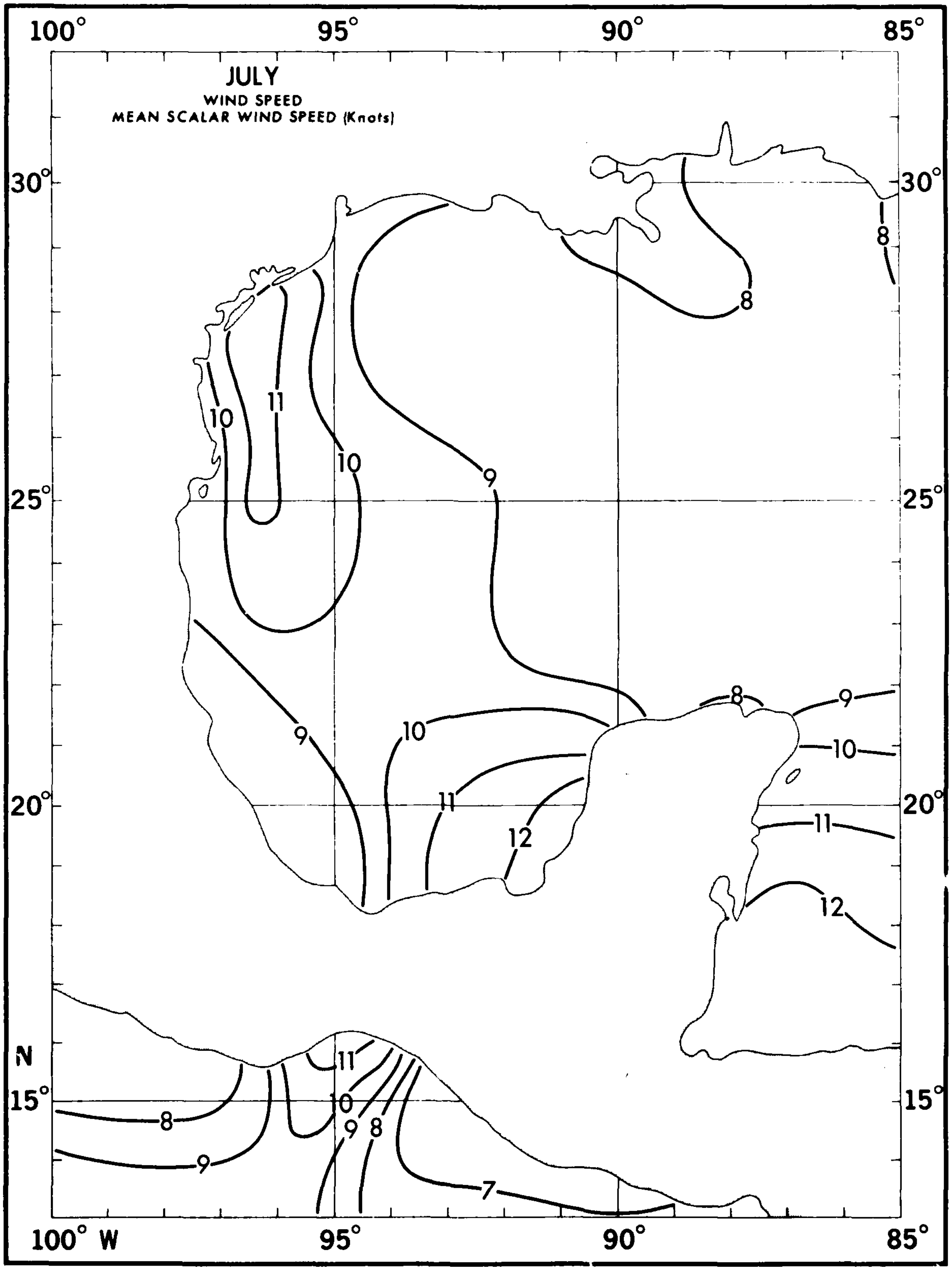


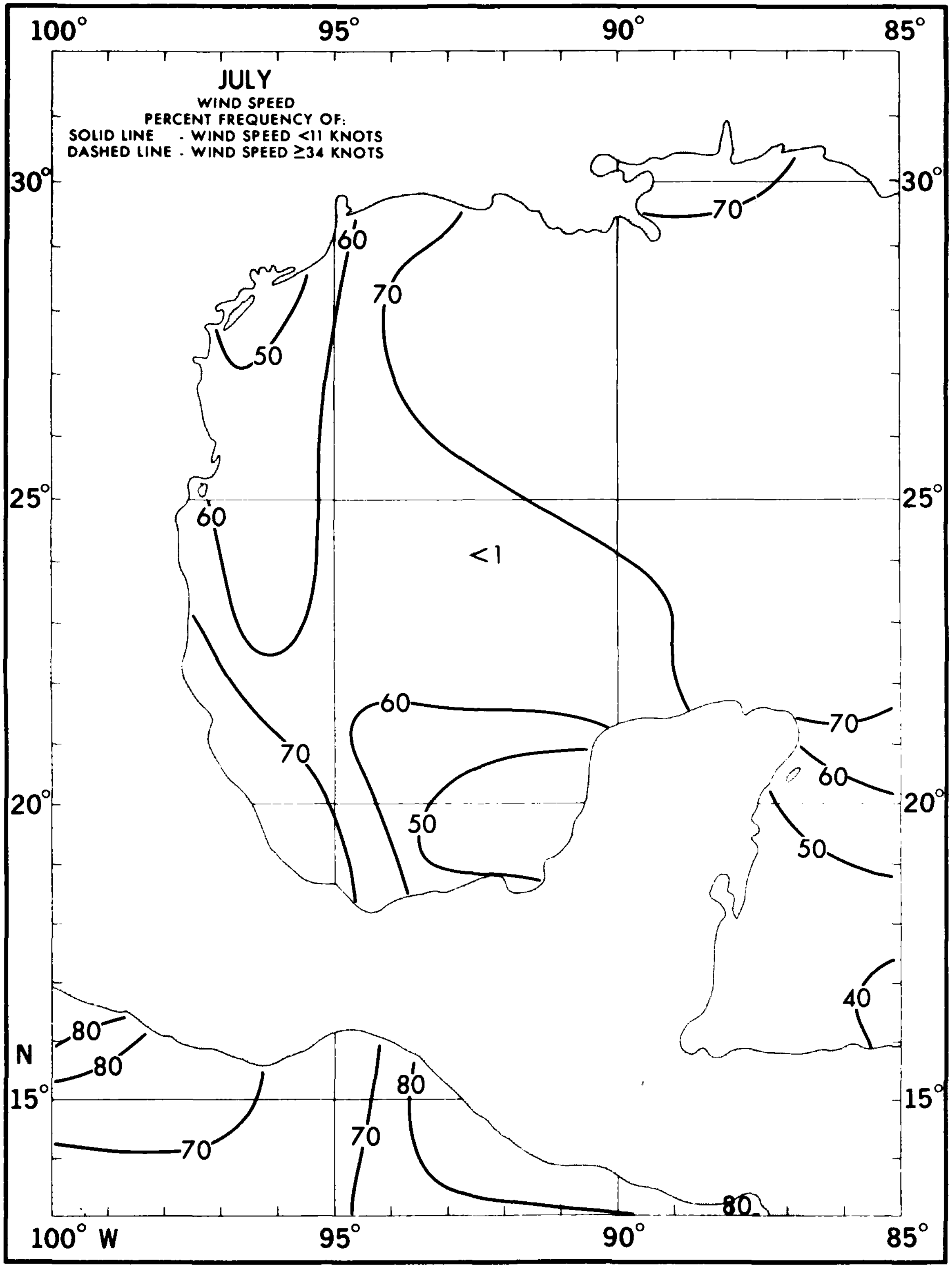
JULY
CEILING-VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES
DASHED LINE - CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
40
30
20
5
20
10
15
30
20
40
5
20
10
30
30
10
30
15
40

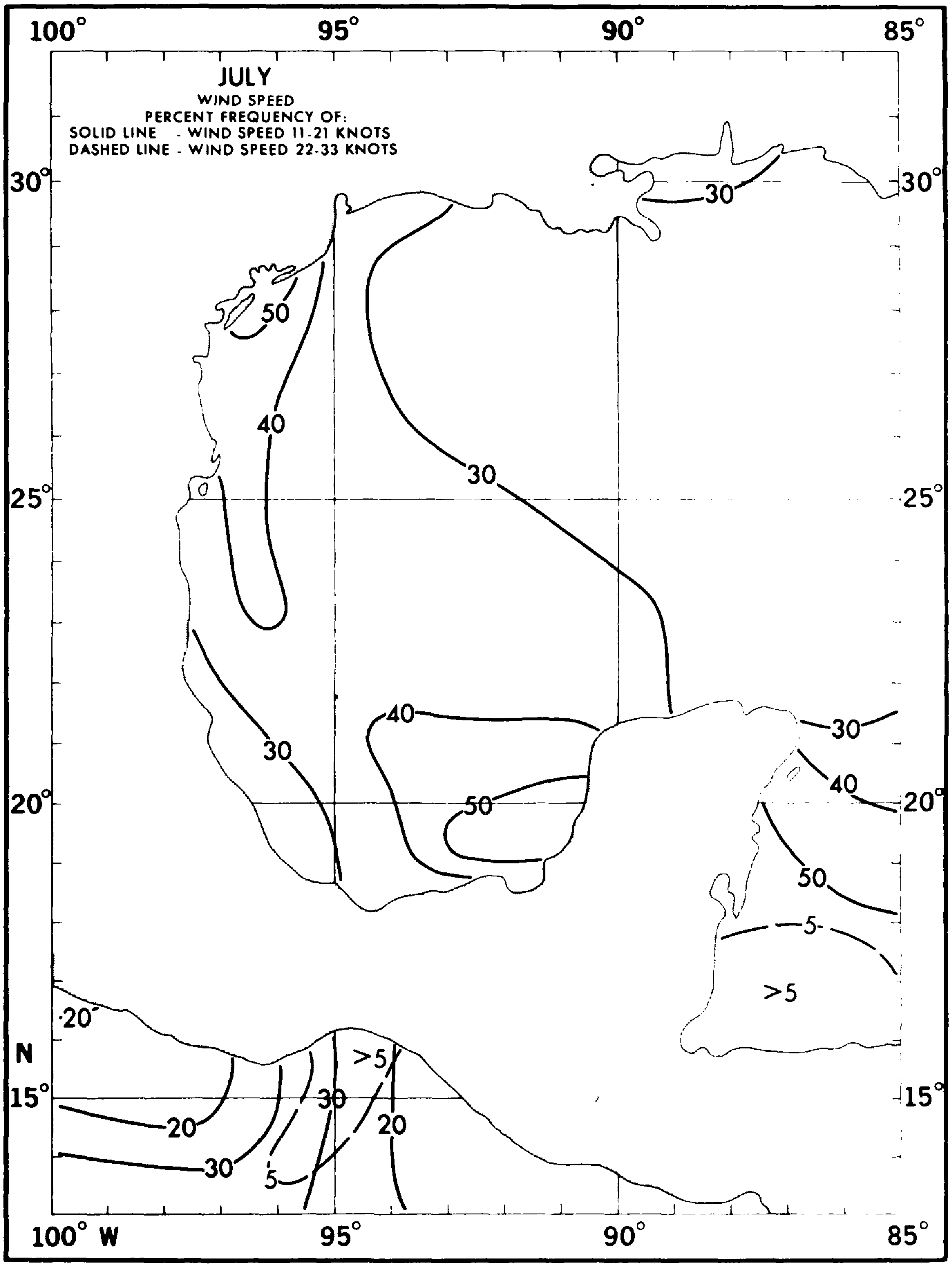

JULY
CEILING-VISIBILITY (LOW RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <300 FEET AND/OR VISIBILITY <1 N. MILE
DASHED LINE - CEILING <600 FEET AND/OR VISIBILITY <2 N. MILES
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
>1
>3
1
2
3
4
5

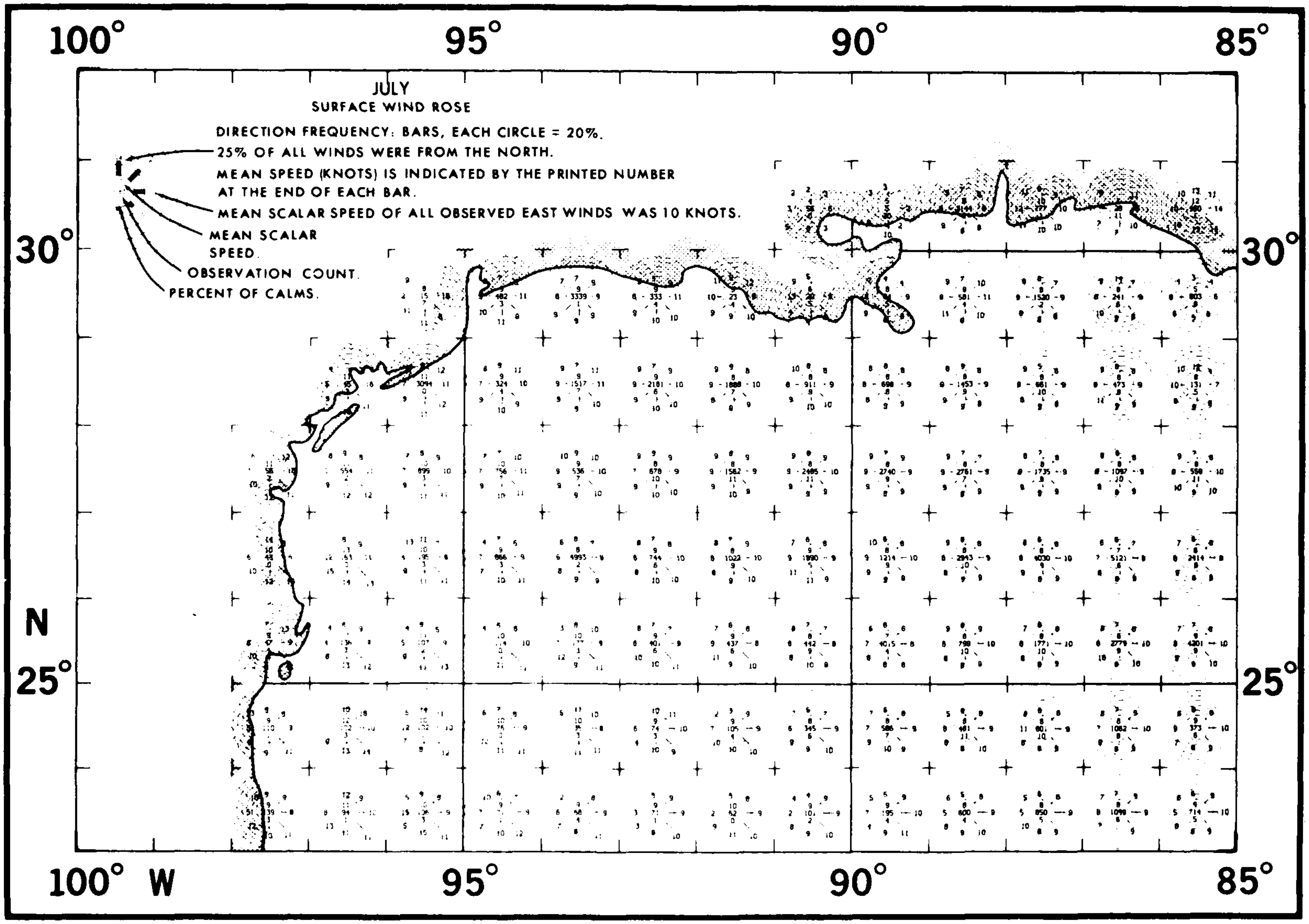


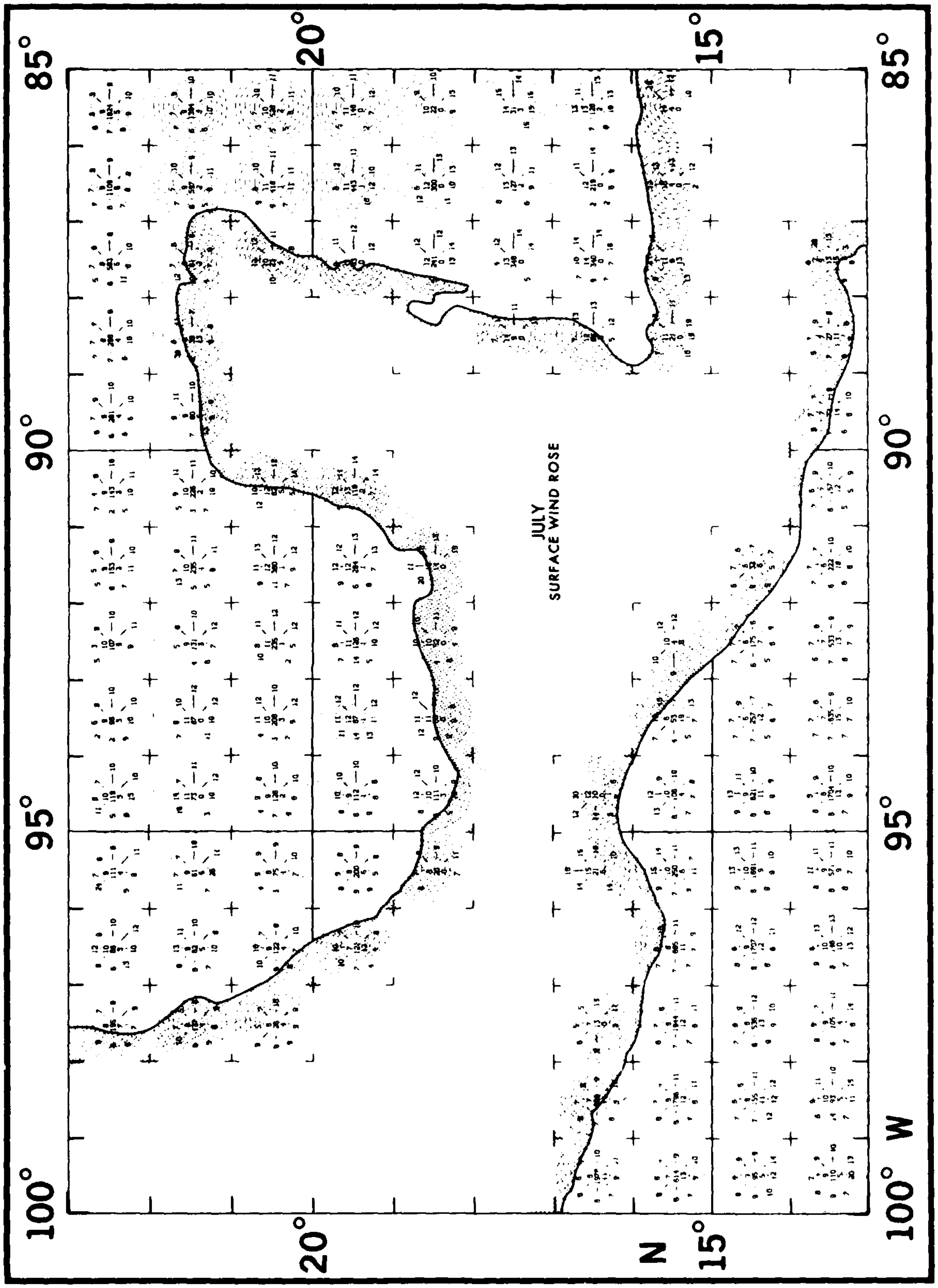
JULY
WIND-VISIBILITY-CLOUDINESS
SOLID LINE - PERCENT FREQUENCY OF OPTIMUM CONDITIONS: LCC ≥5000 FT., (OR NO LCC), VSBY. ≥5 N. MI. AND WIND 11-21 KTS.
DASHED LINE - PERCENT FREQUENCY OF POOR CONDITIONS. ANY ONE OF THE FOLLOWING CONSTITUTES POOR CONDITIONS: LCC <300 FT., VSBY. <1 N. MI., WIND <6 OR ≥34 KTS.
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W

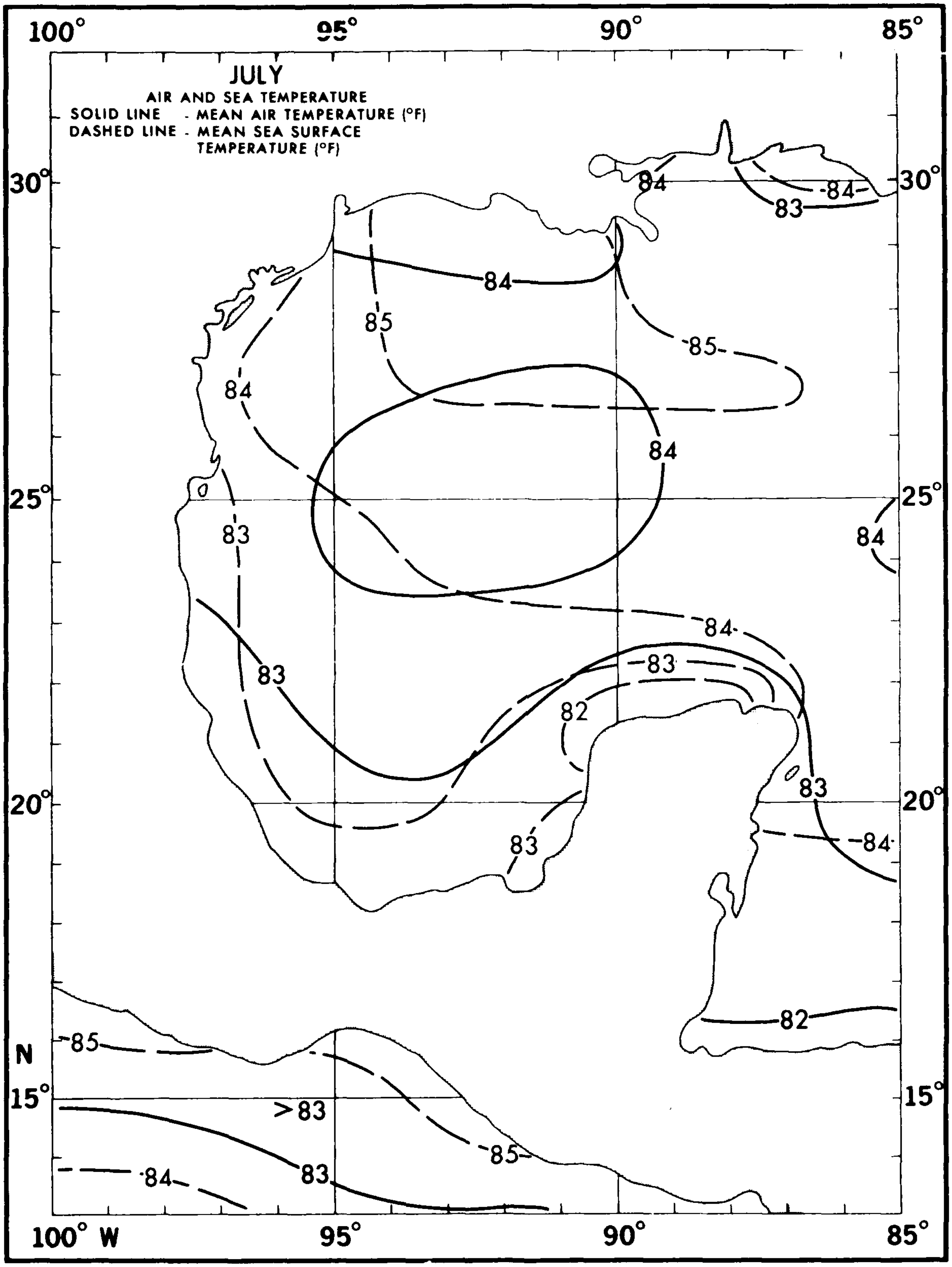

JULY
WIND SPEED
MEAN SCALAR WIND SPEED (Knots)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
8
9
10
11
12
7


JULY
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED <11 KNOTS
DASHED LINE - WIND SPEED ≥34 KNOTS
100°
95°
90°
85°
30°
25°
20°
15°
100° W
N
<1
70
60
50
80
40

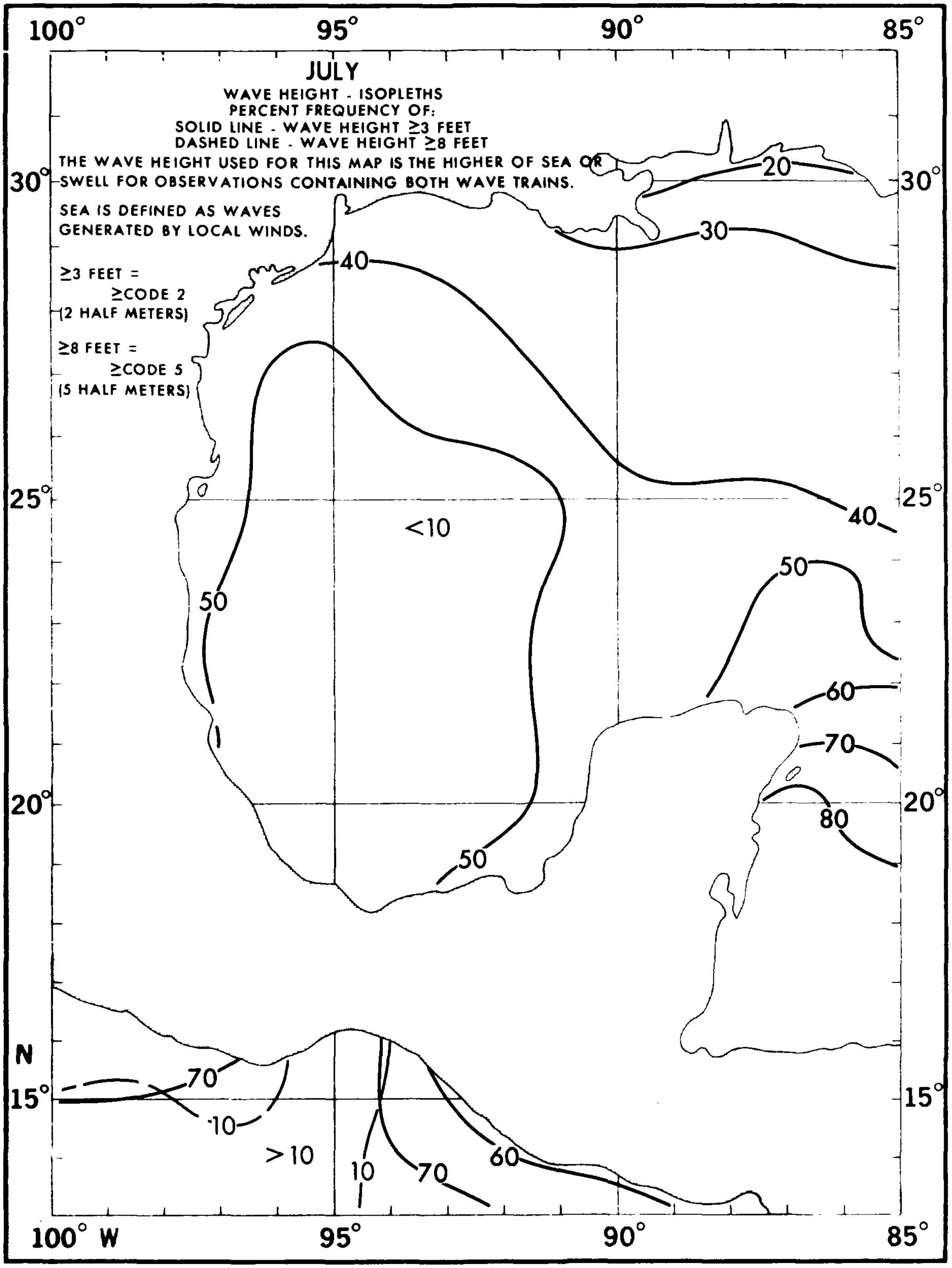

JULY
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED 11-21 KNOTS
DASHED LINE - WIND SPEED 22-33 KNOTS
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
50
40
30
>5
5
20

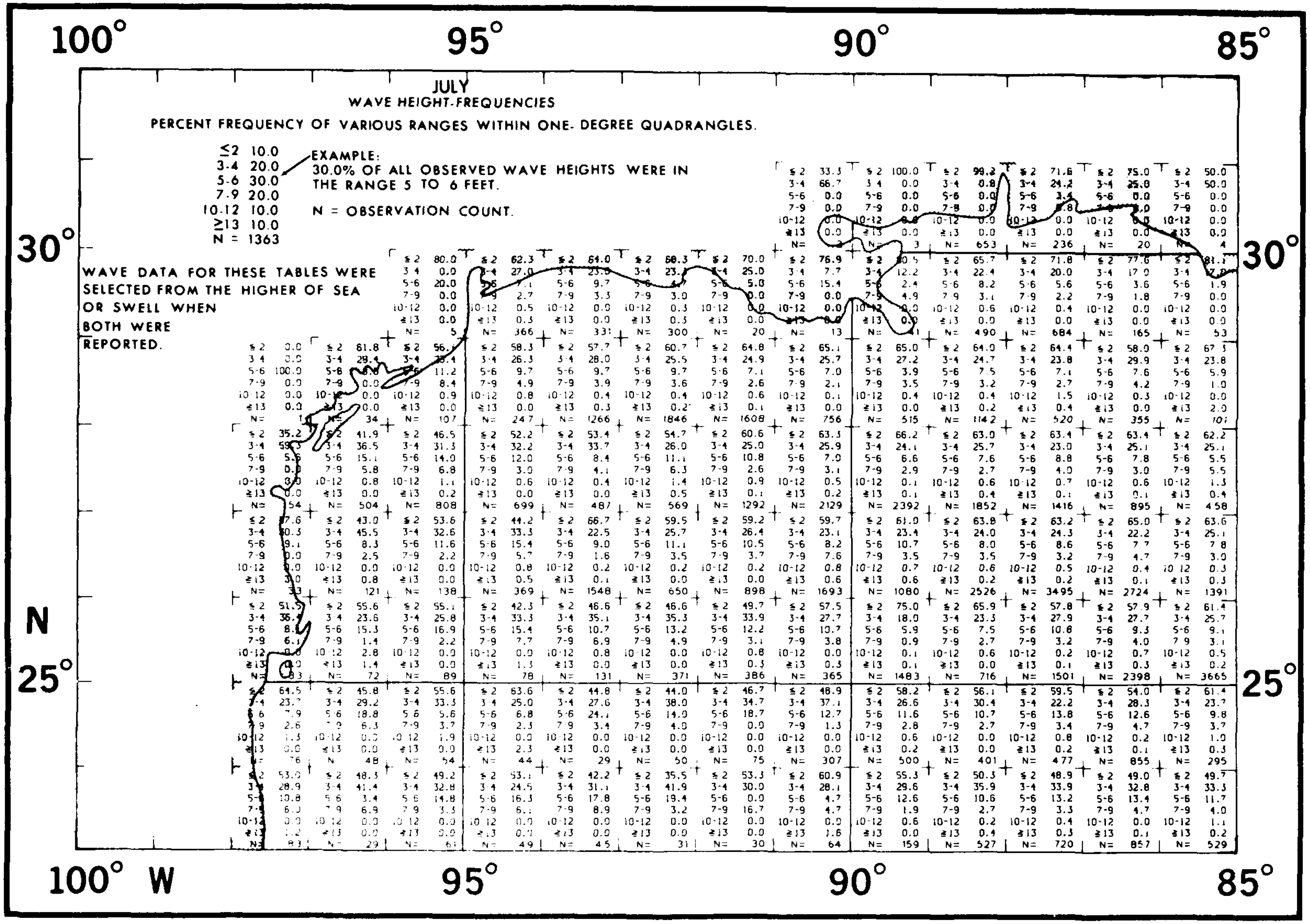

JULY
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM THE NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
100°
95°
90°
85°
30°
25°
N
100° W

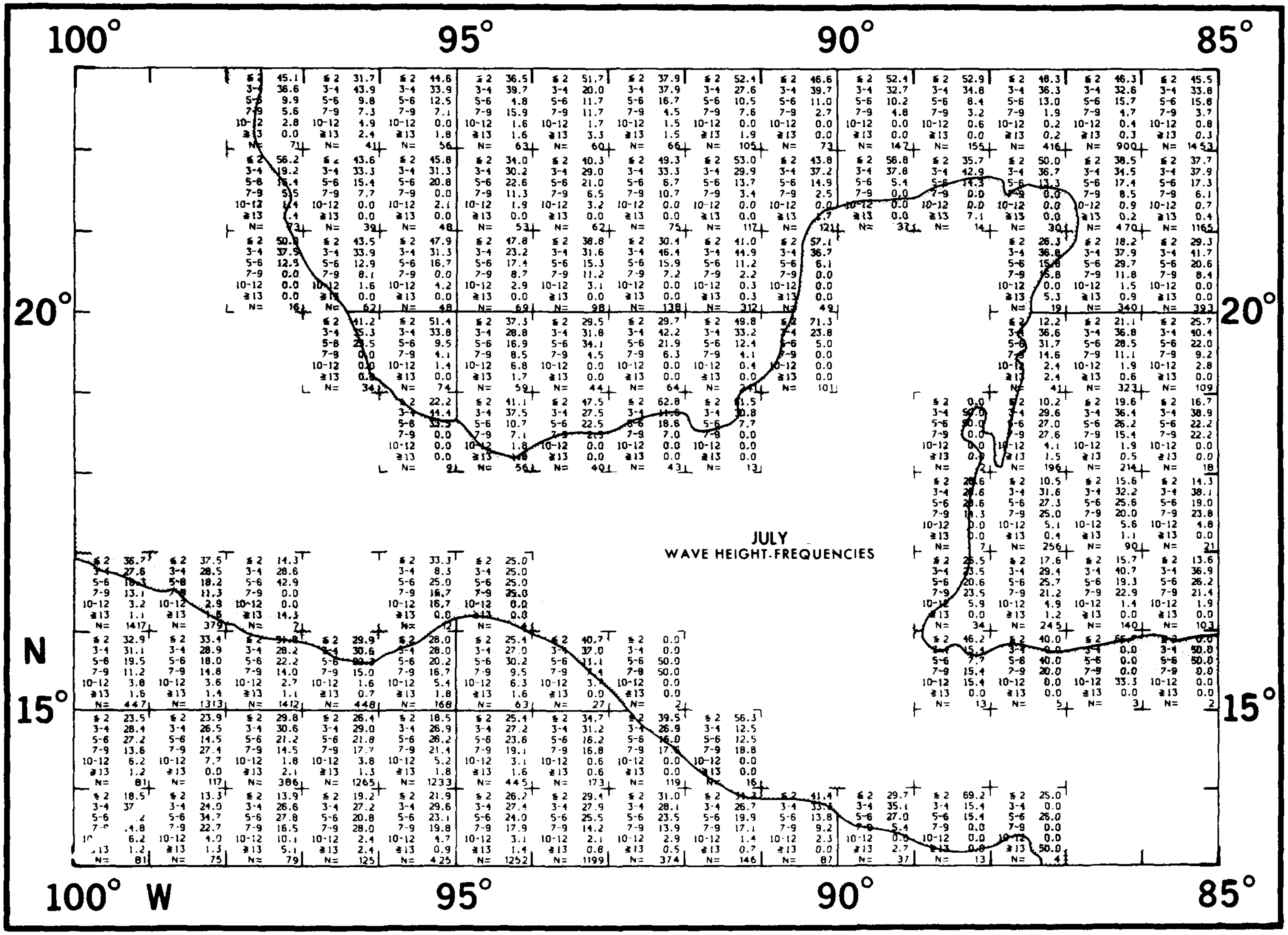

JULY
SURFACE WIND ROSE
85°
90°
95°
100°
20°
15°
N
100° W

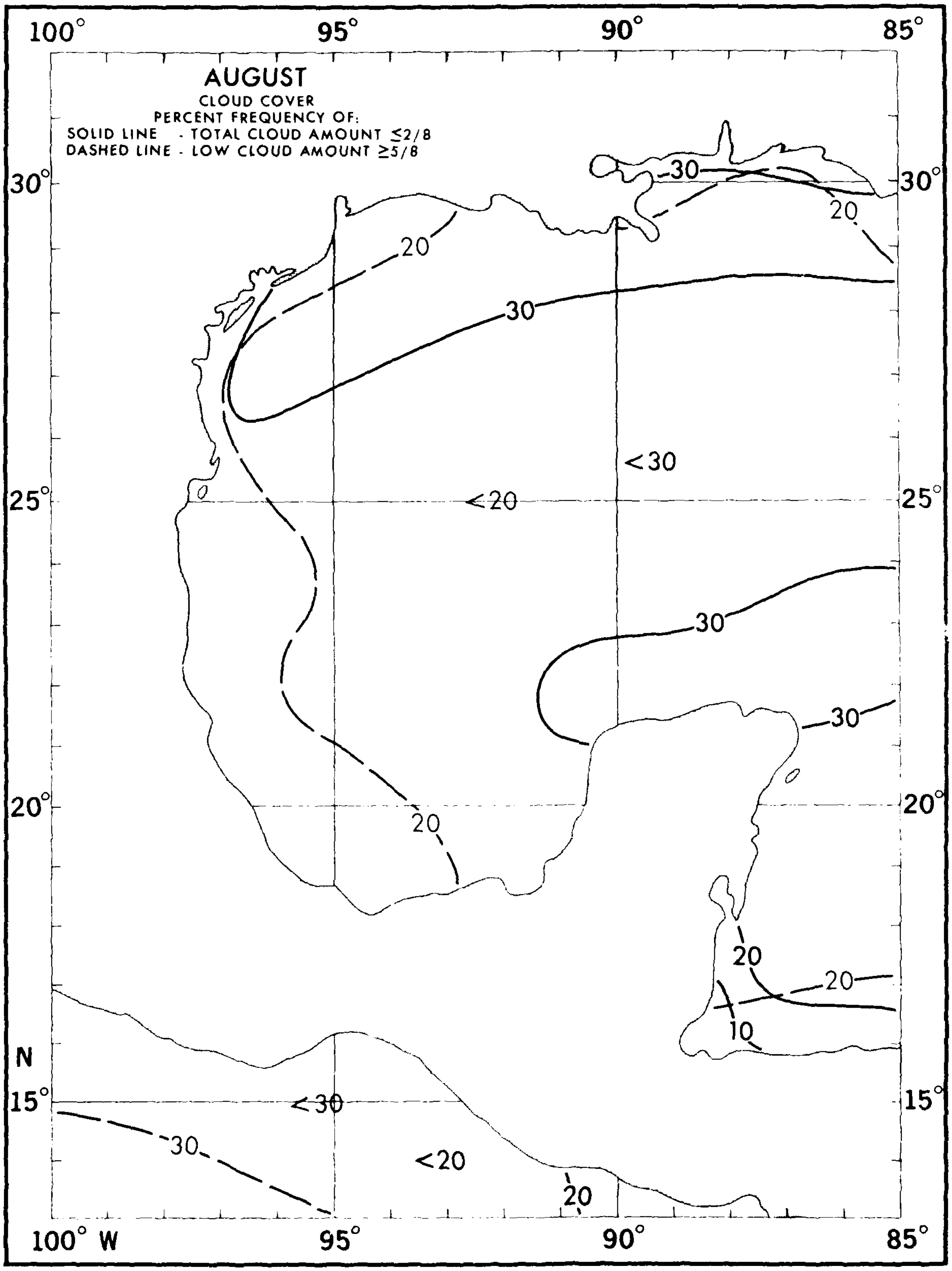


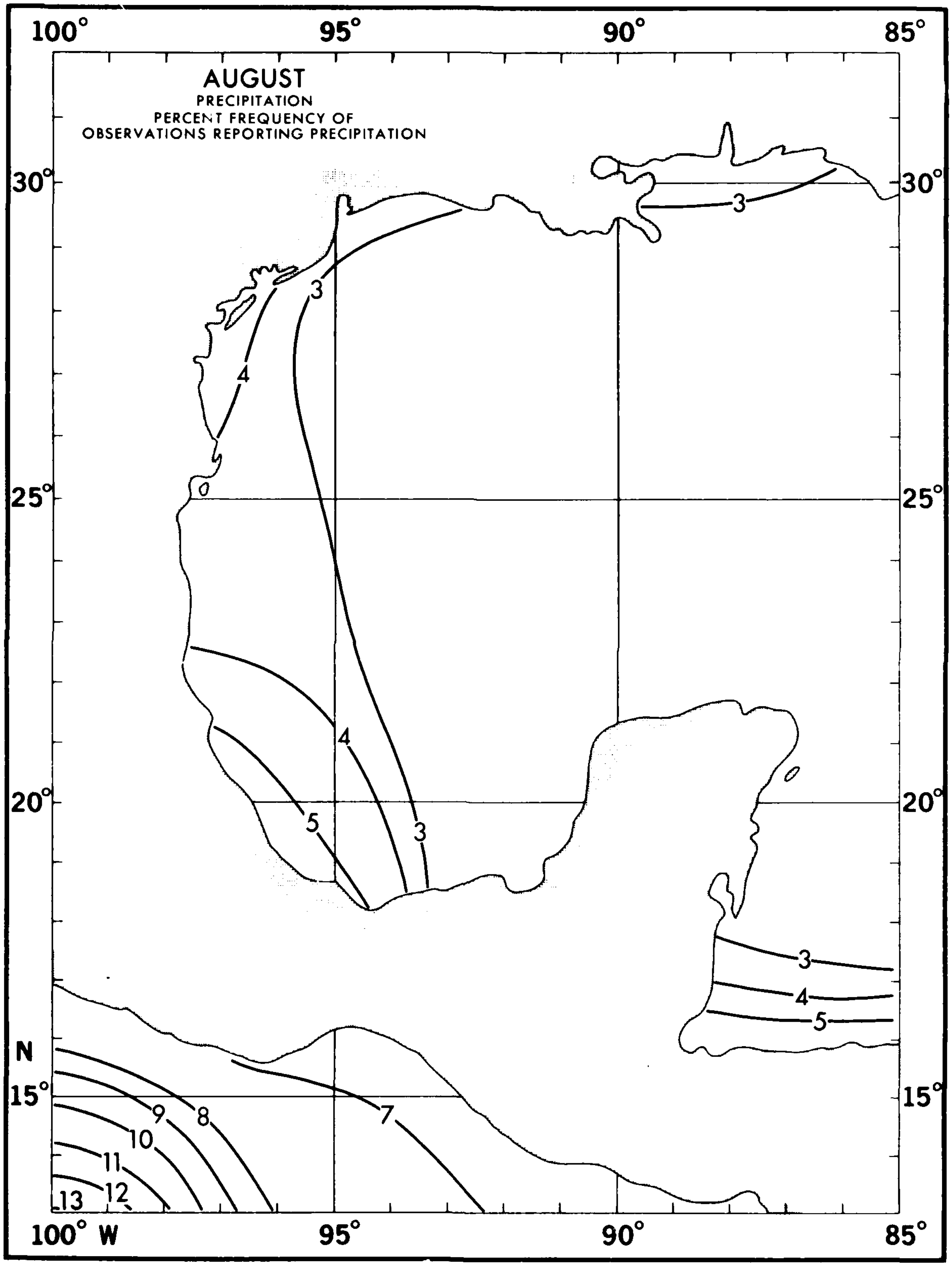
100°
95°
90°
85°
JULY
AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
30°
25°
20°
15°
N
84
83
85
82
>83
100° W
95°
90°
85°

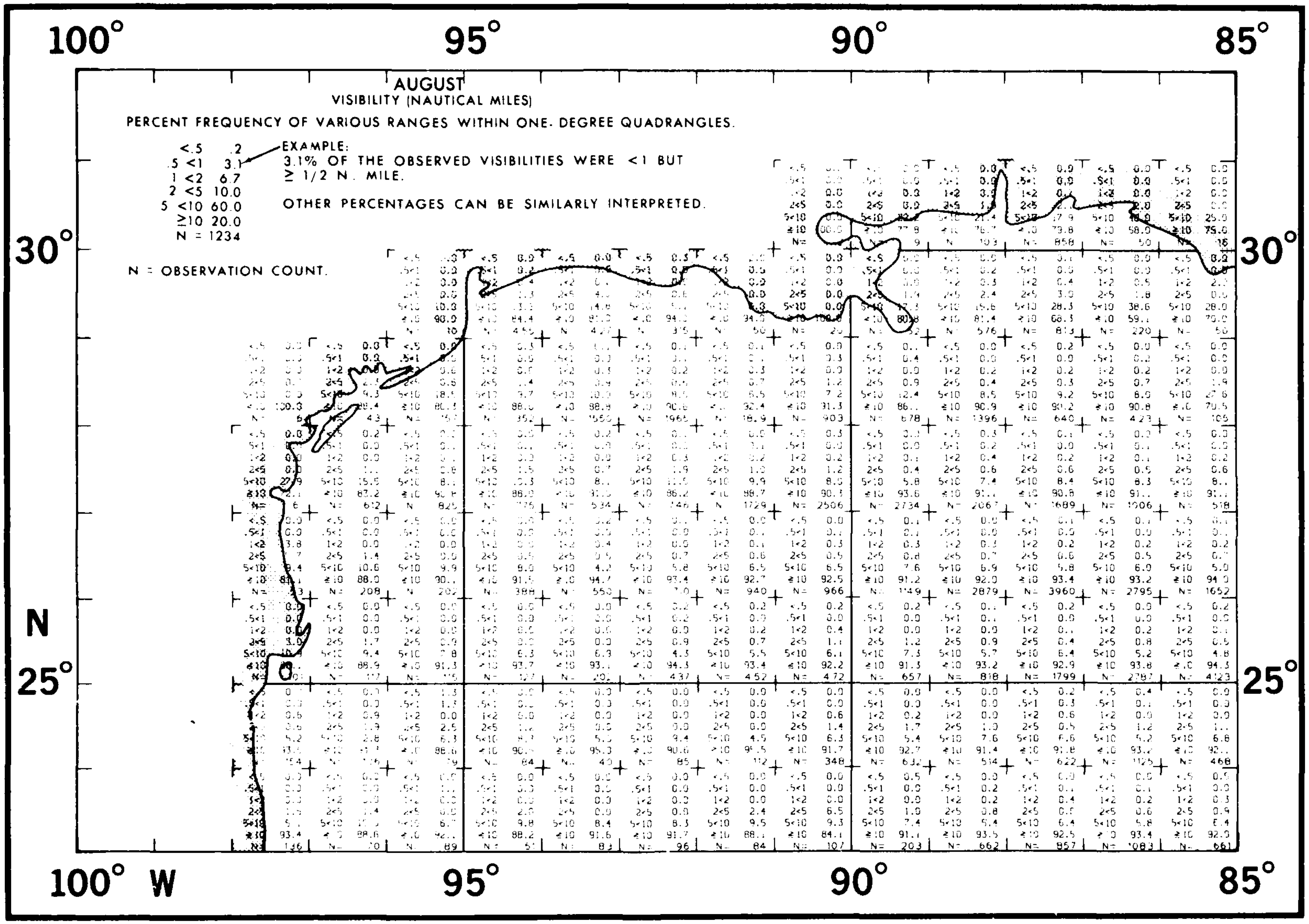

100°
95°
90°
85°
JULY
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
SOLID LINE - WAVE HEIGHT ≥3 FEET
DASHED LINE - WAVE HEIGHT ≥8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS.
SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
30°
25°
20°
15°
N
20
30
40
50
<10
40
50
60
70
80
50
70
10
>10
10
70
60
100° W
95°
90°
85°

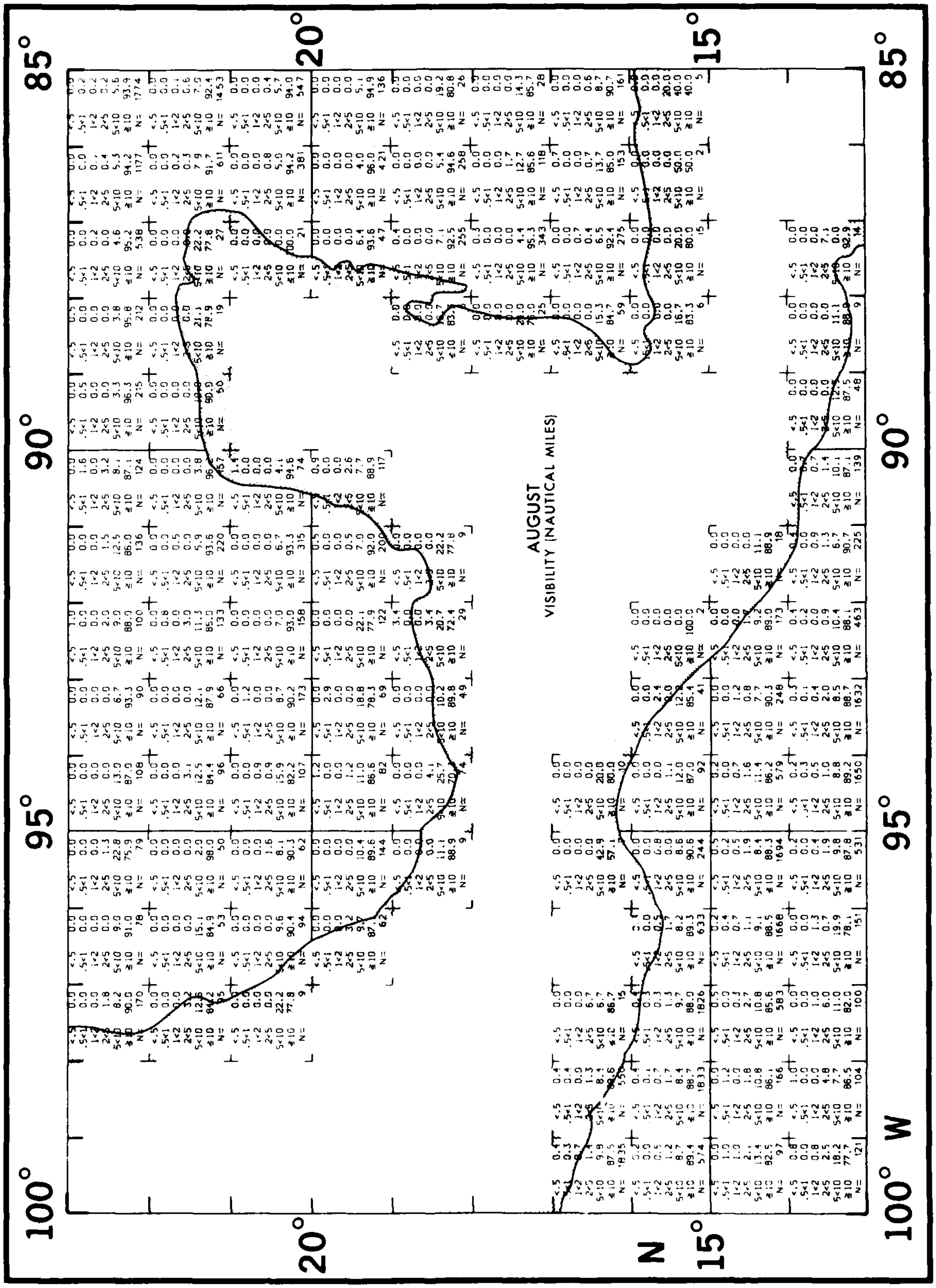

100°
95°
90°
85°
JULY
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE- DEGREE QUADRANGLES.
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
EXAMPLE:
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
30°
N
25°
100° W
95°
90°
85°

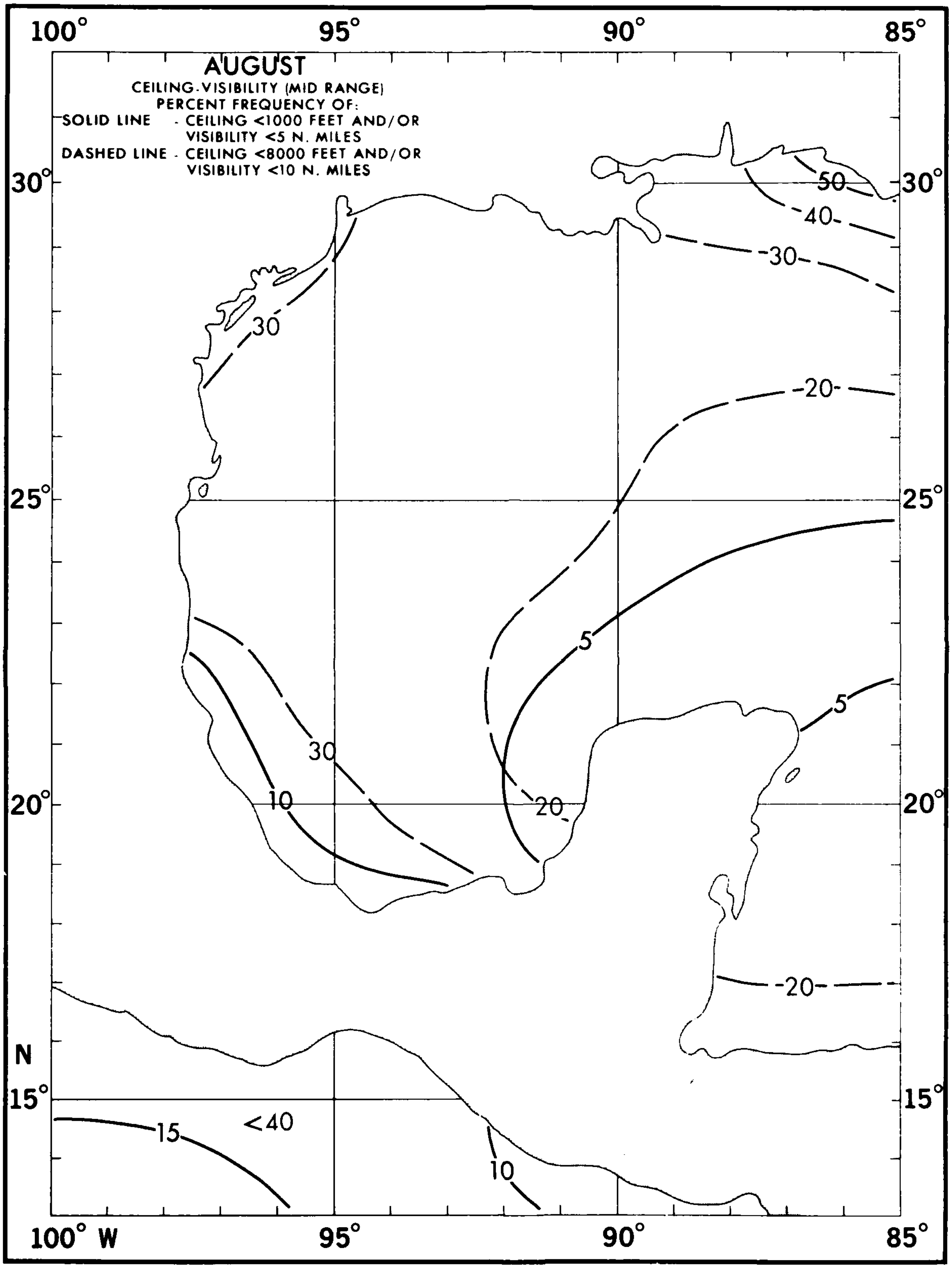

JULY
WAVE HEIGHT-FREQUENCIES
100°
95°
90°
85°
20°
15°
N
100° W


AUGUST
CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE - TOTAL CLOUD AMOUNT ≤2/8
DASHED LINE - LOW CLOUD AMOUNT ≥5/8
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
30
20
30
<30
<20
30
30
20
20
20
10
<30
30
<20
20

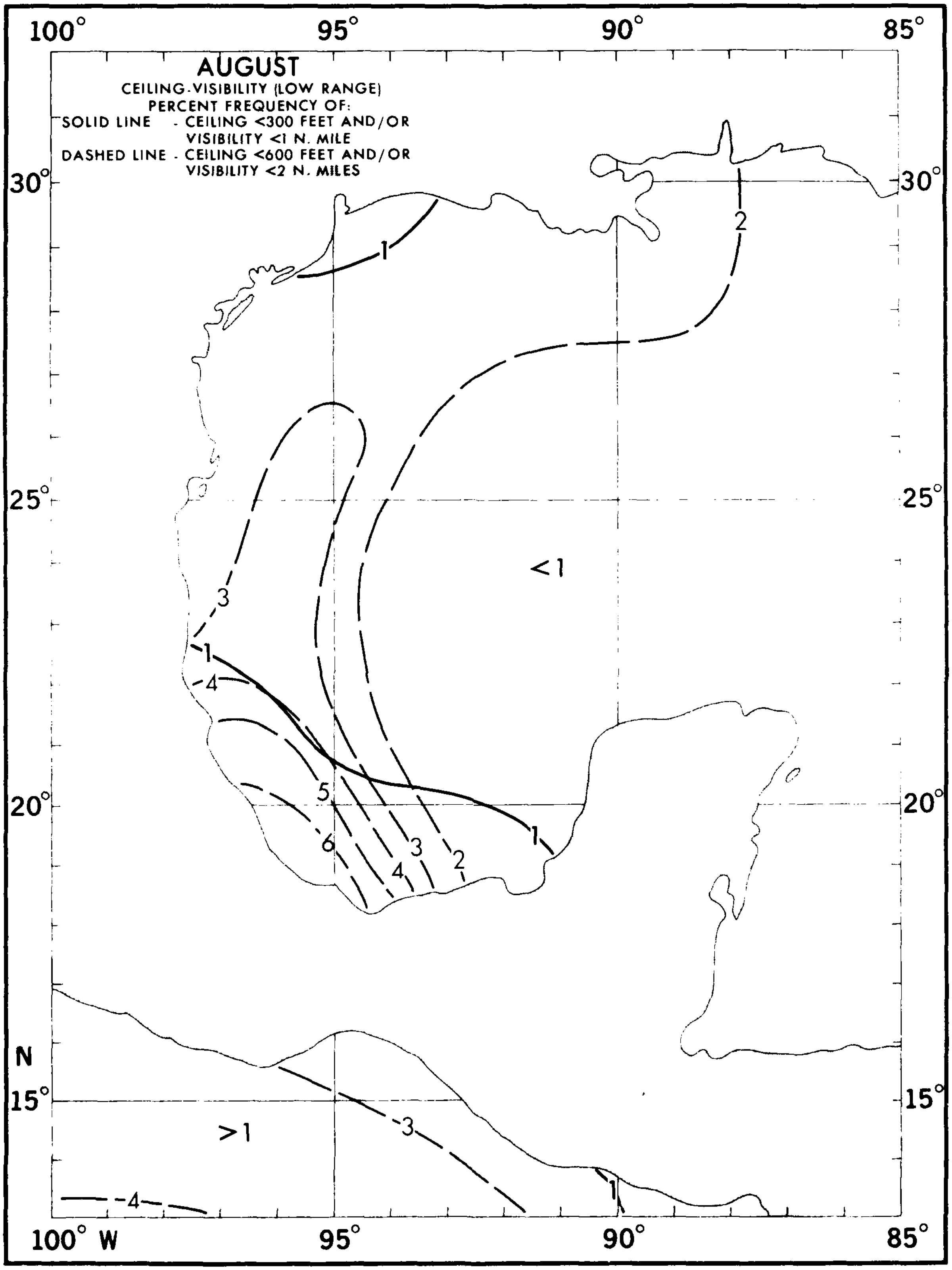

AUGUST
PRECIPITATION
PERCENT FREQUENCY OF
OBSERVATIONS REPORTING PRECIPITATION
100°
95°
90°
85°
30°
25°
20°
N
15°
100° W
3
4
5
7
8
9
10
11
12
13

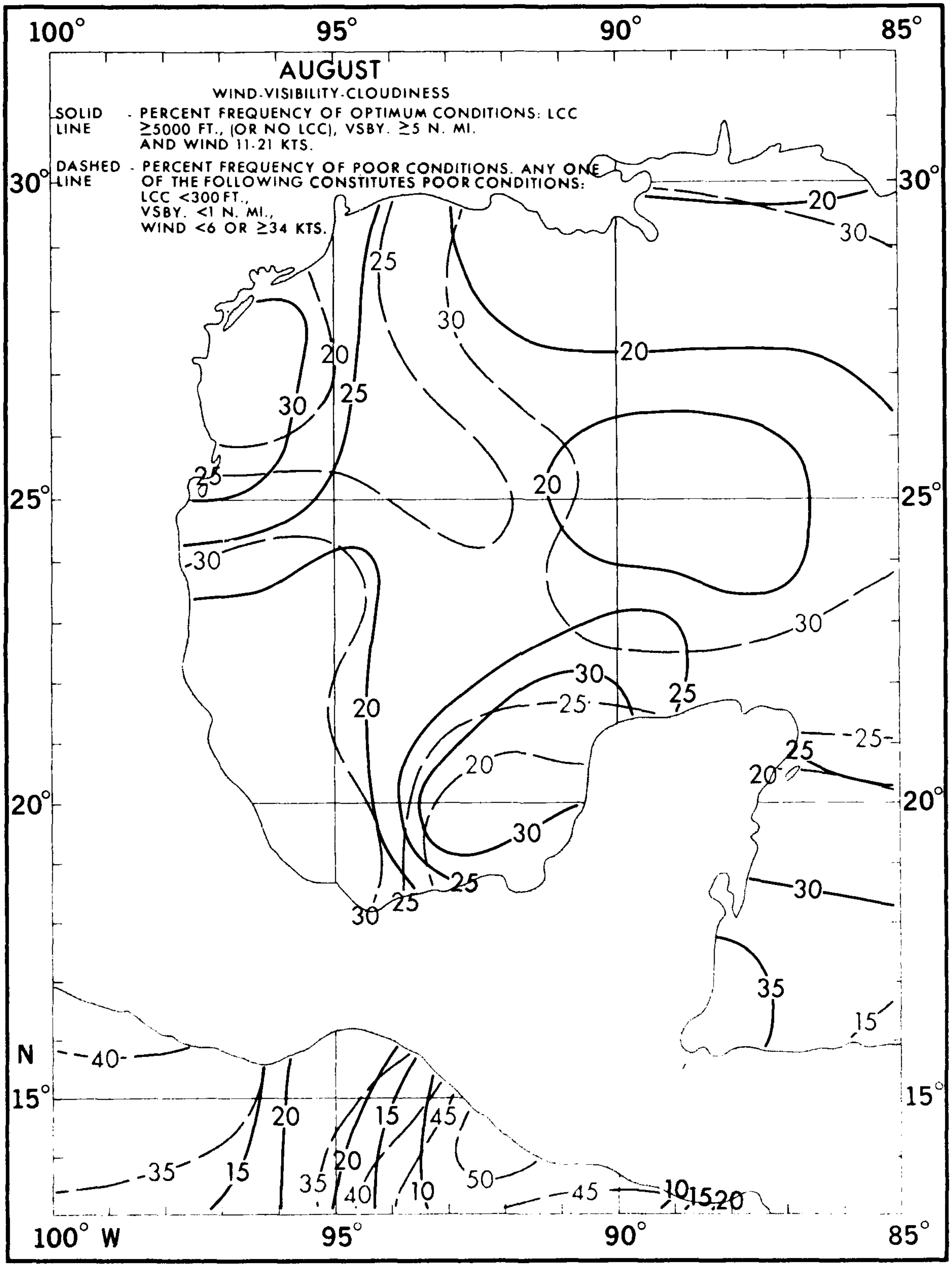

AUGUST
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE- DEGREE QUADRANGLES.
<.5 .2
.5 <1 3.1
1 <2 6.7
2 <5 10.0
5 <10 60.0
≥10 20.0
N = 1234
EXAMPLE:
3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥ 1/2 N. MILE.
OTHER PERCENTAGES CAN BE SIMILARLY INTERPRETED.
N = OBSERVATION COUNT.
100°
95°
90°
85°
30°
N
25°
100° W

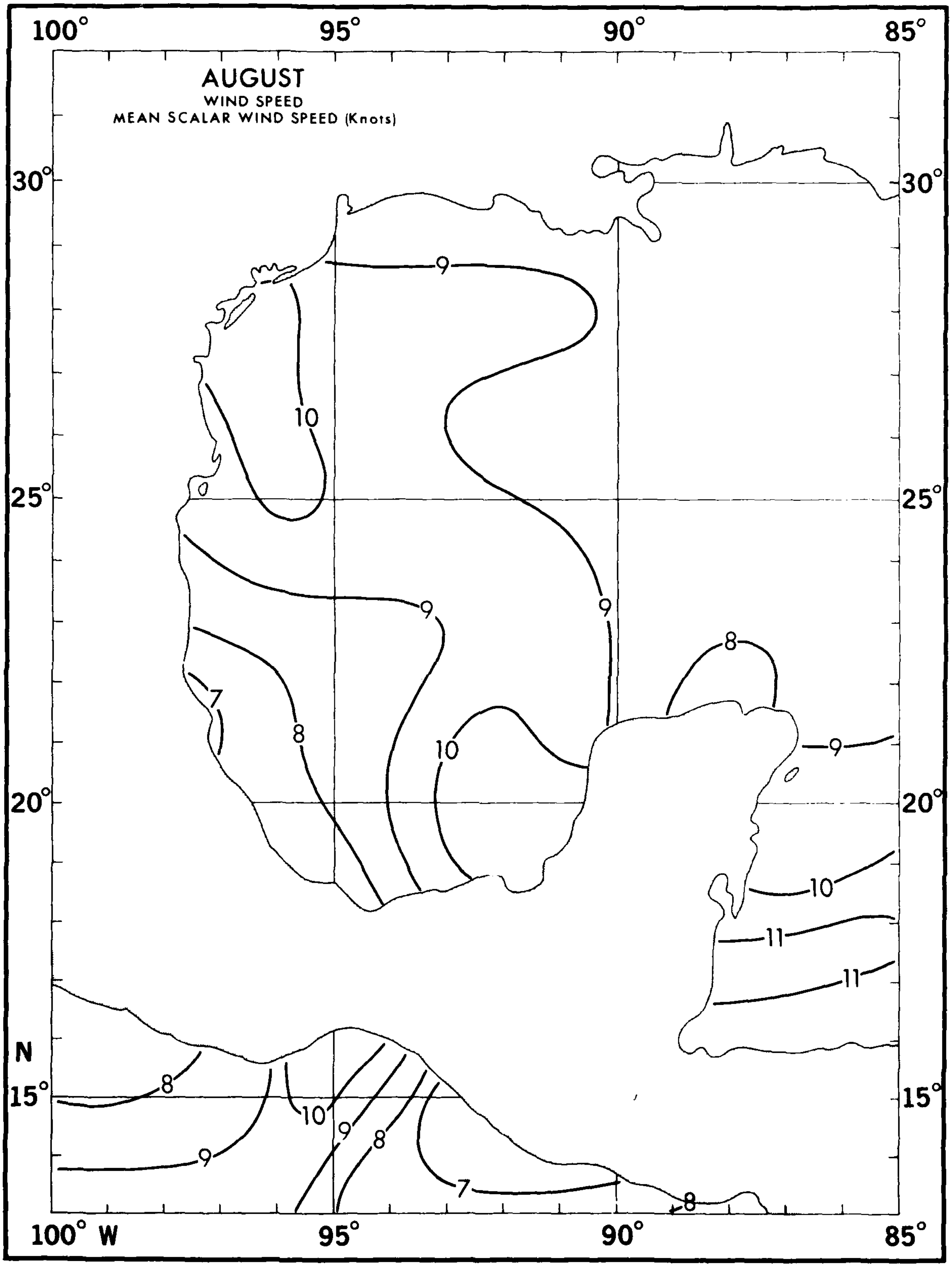

AUGUST
VISIBILITY (NAUTICAL MILES)
100° W
95°
90°
85°
20°
15°
N

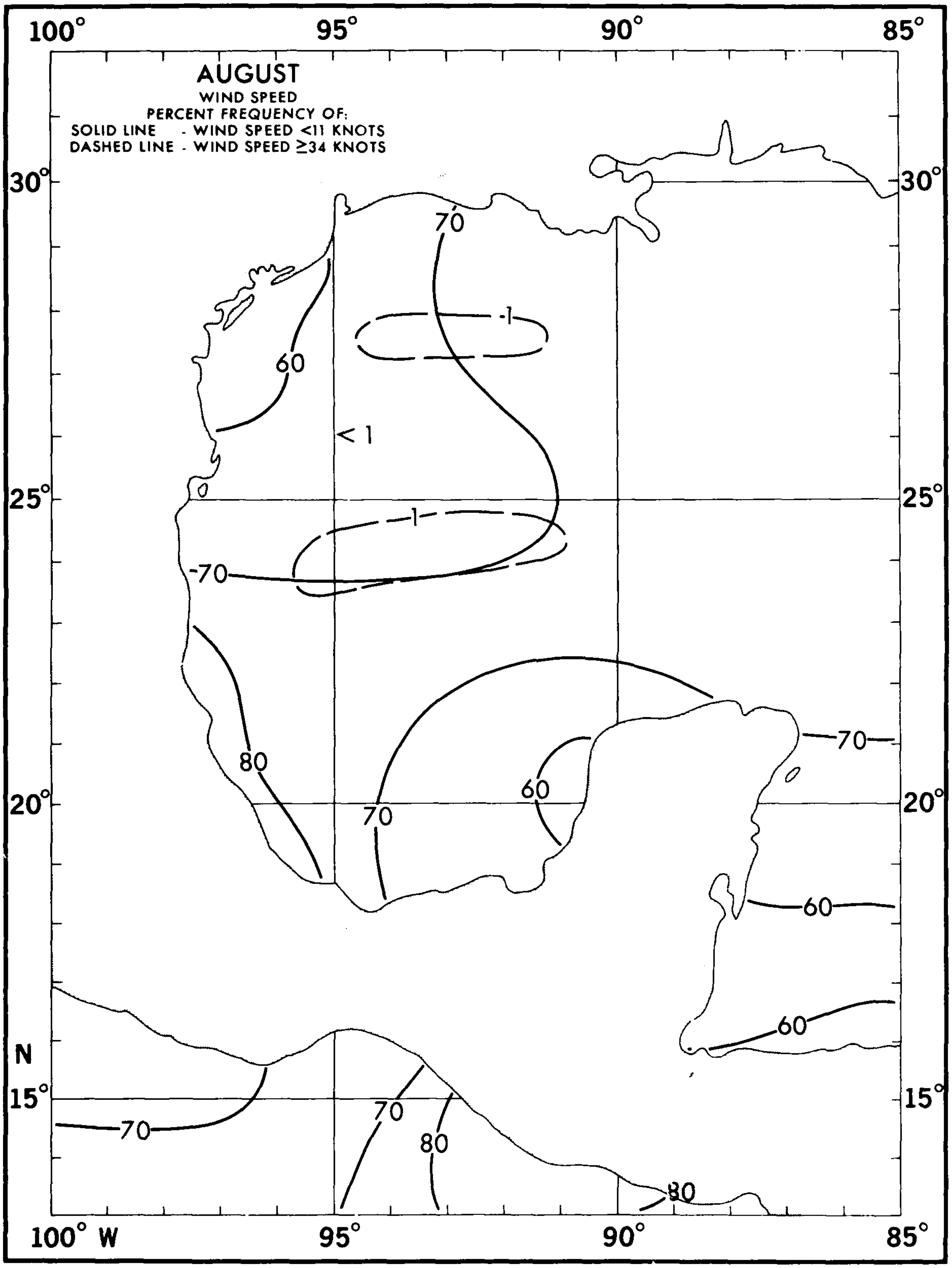


100°
95°
90°
85°
AUGUST
CEILING-VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES
DASHED LINE - CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES
30°
25°
20°
15°
N
50
40
30
30
20
5
5
30
10
20
20
15
<40
10
100° W

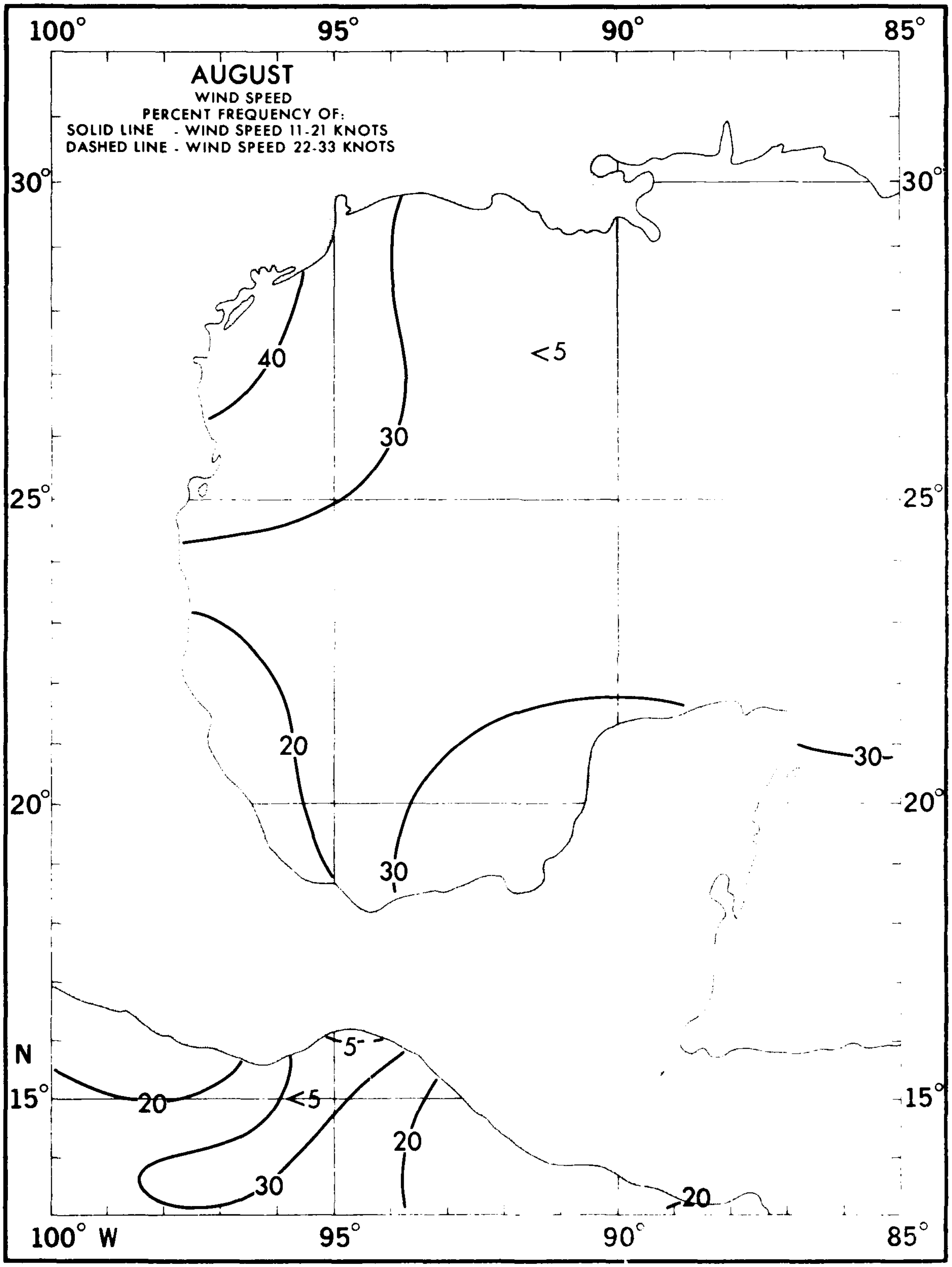

AUGUST
CEILING-VISIBILITY (LOW RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <300 FEET AND/OR VISIBILITY <1 N. MILE
DASHED LINE - CEILING <600 FEET AND/OR VISIBILITY <2 N. MILES
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
<1
>1
1
2
3
4
5
6

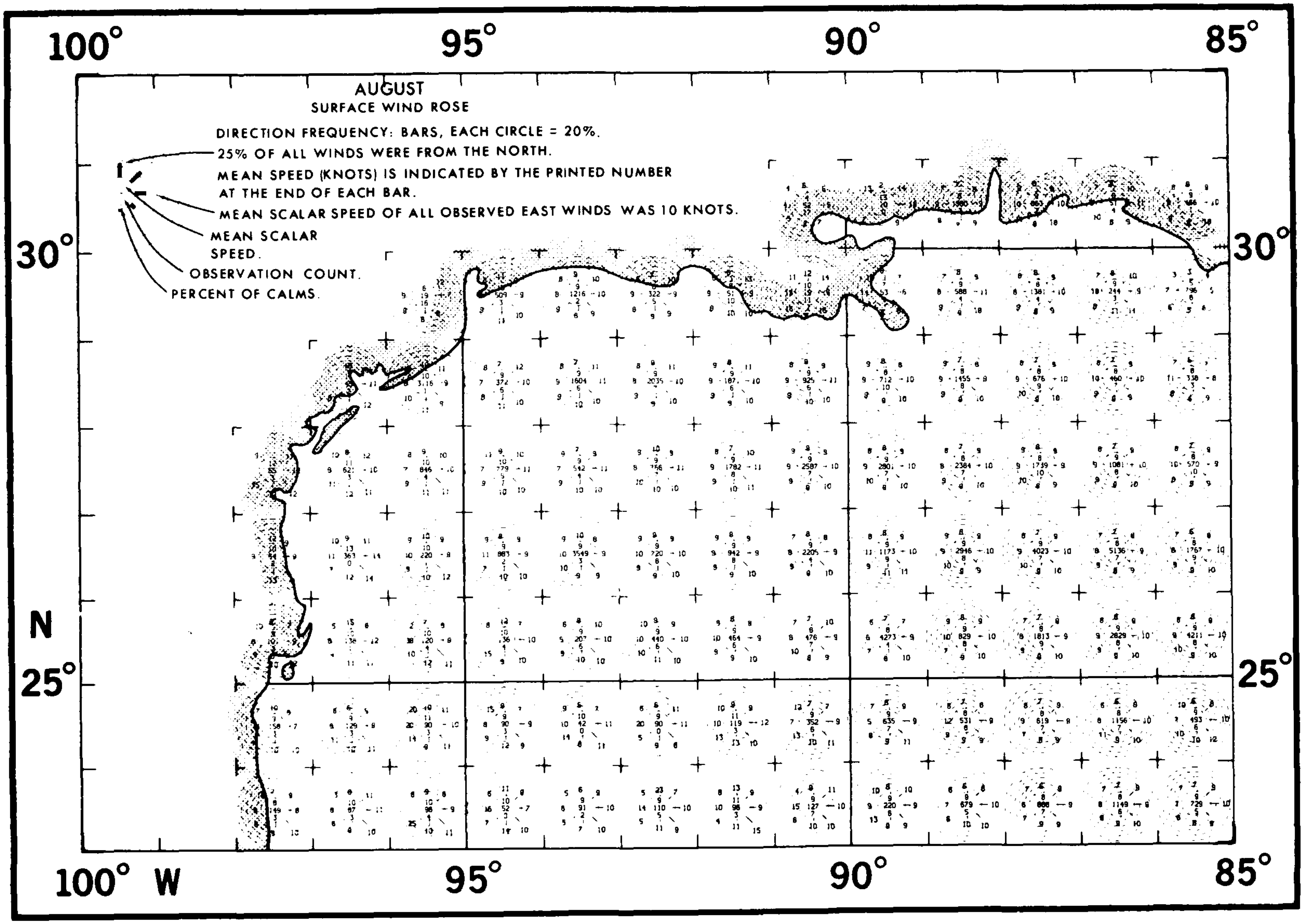

AUGUST
WIND-VISIBILITY-CLOUDINESS
SOLID LINE - PERCENT FREQUENCY OF OPTIMUM CONDITIONS: LCC ≥5000 FT., (OR NO LCC), VSBY. ≥5 N. MI. AND WIND 11-21 KTS.
DASHED LINE - PERCENT FREQUENCY OF POOR CONDITIONS. ANY ONE OF THE FOLLOWING CONSTITUTES POOR CONDITIONS: LCC <300 FT., VSBY. <1 N. MI., WIND <6 OR ≥34 KTS.
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W


AUGUST
WIND SPEED
MEAN SCALAR WIND SPEED (Knots)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
9
10
8
7
11

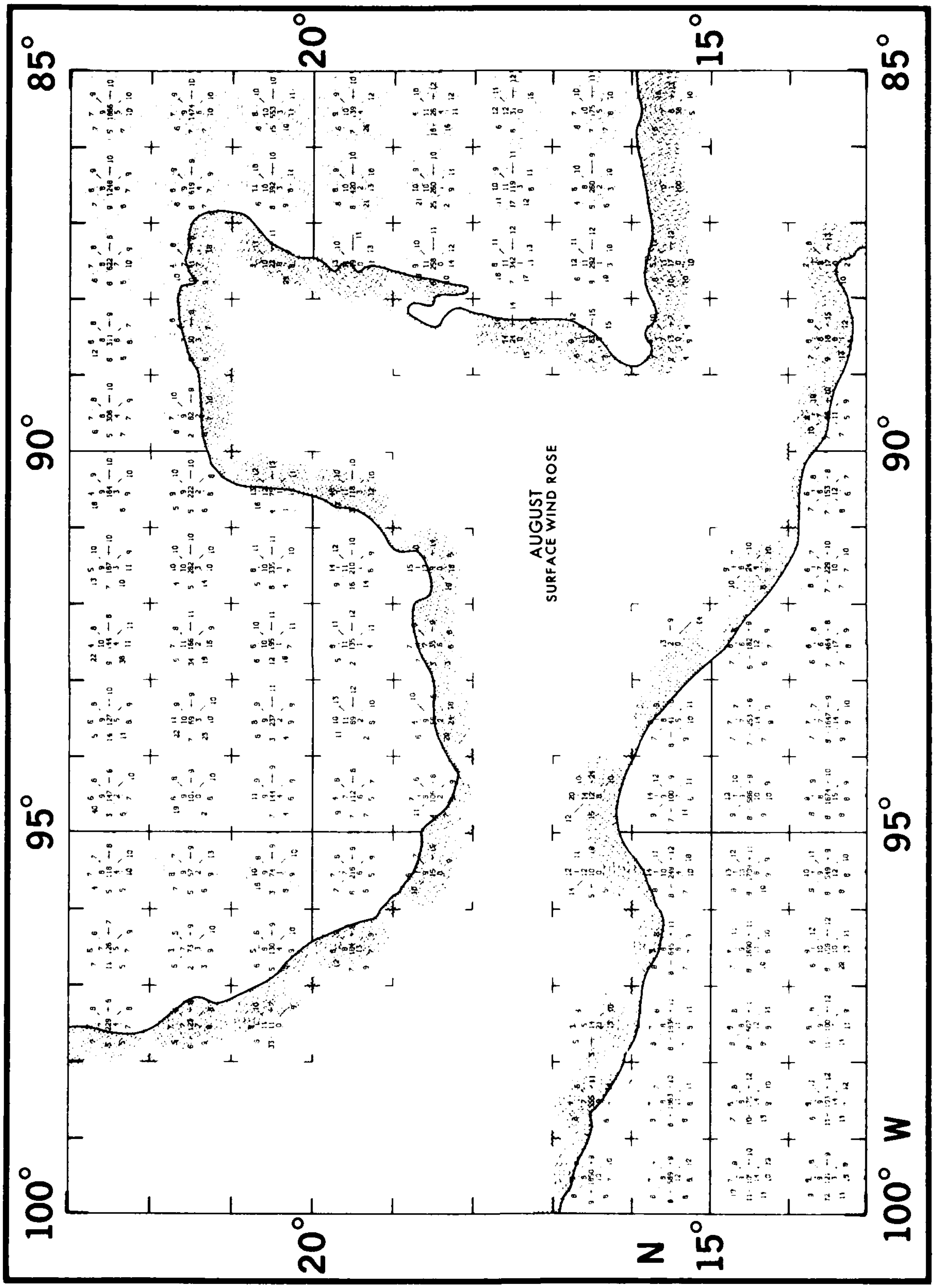


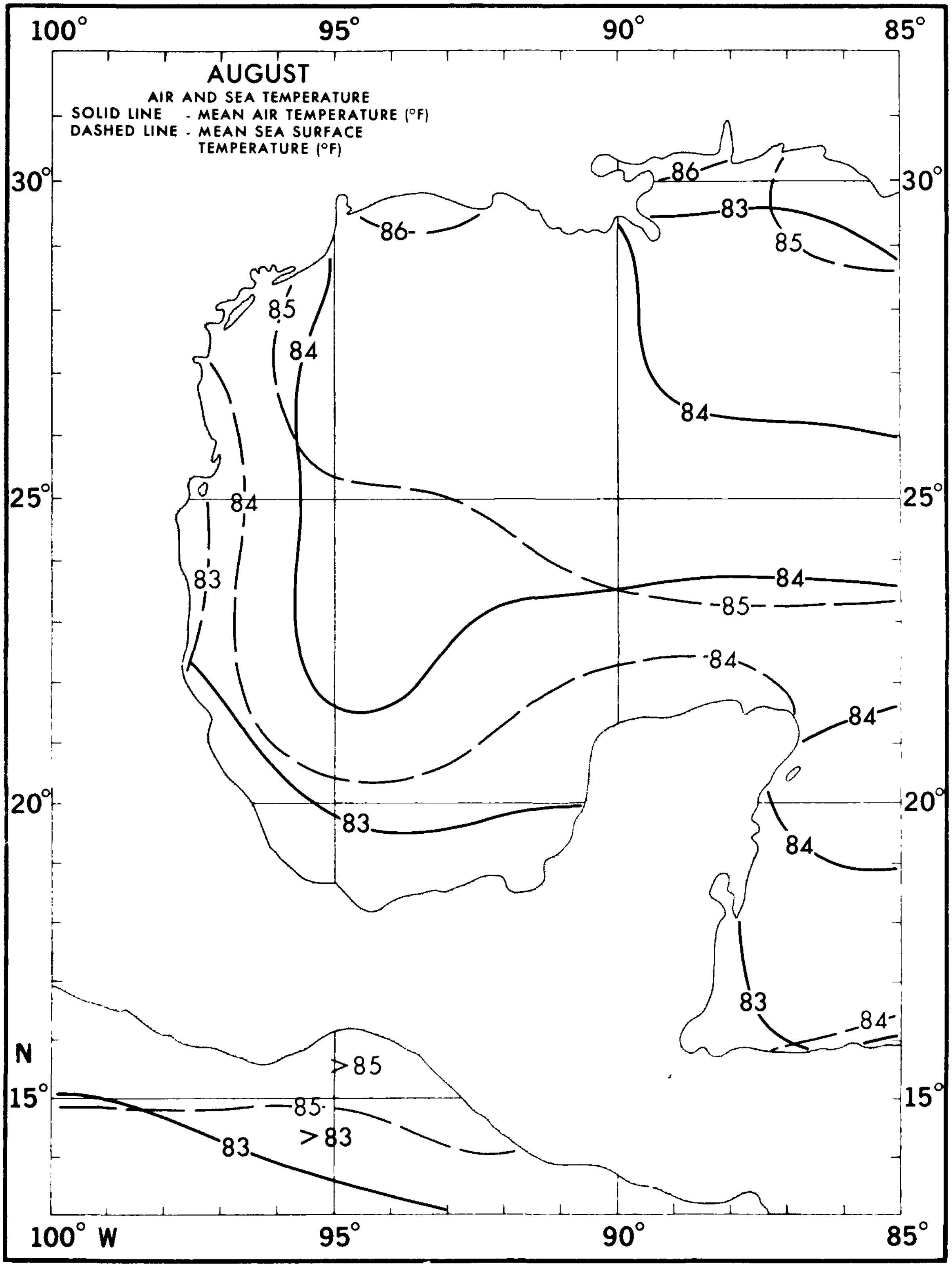
AUGUST
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED <11 KNOTS
DASHED LINE - WIND SPEED ≥34 KNOTS
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
70
-1
60
< 1
-70
80
60
-70-
-60-
60
70
80
80


AUGUST
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED 11-21 KNOTS
DASHED LINE - WIND SPEED 22-33 KNOTS
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
40
30
<5
20
30
30
5
<5
20
20
30
20

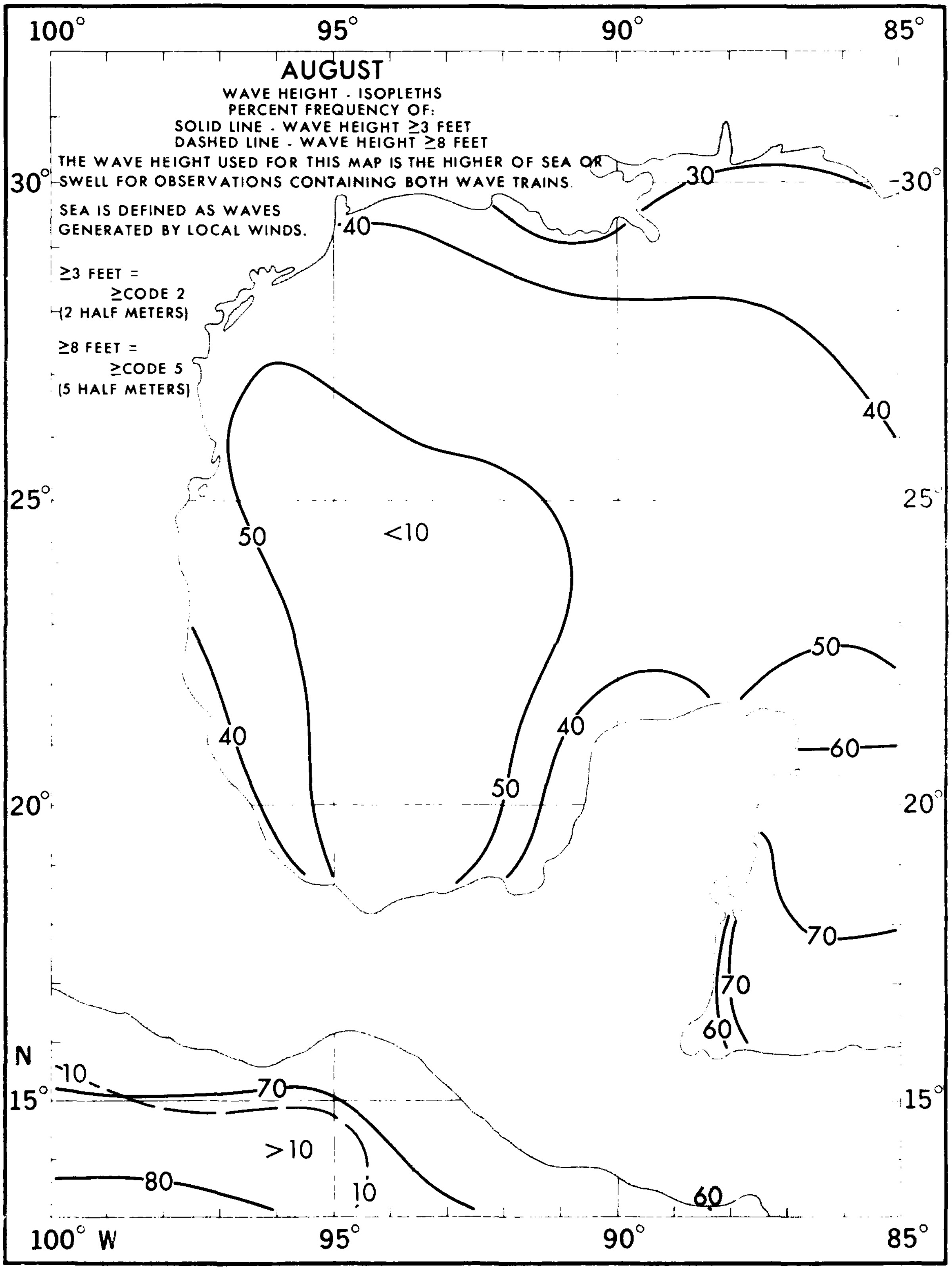


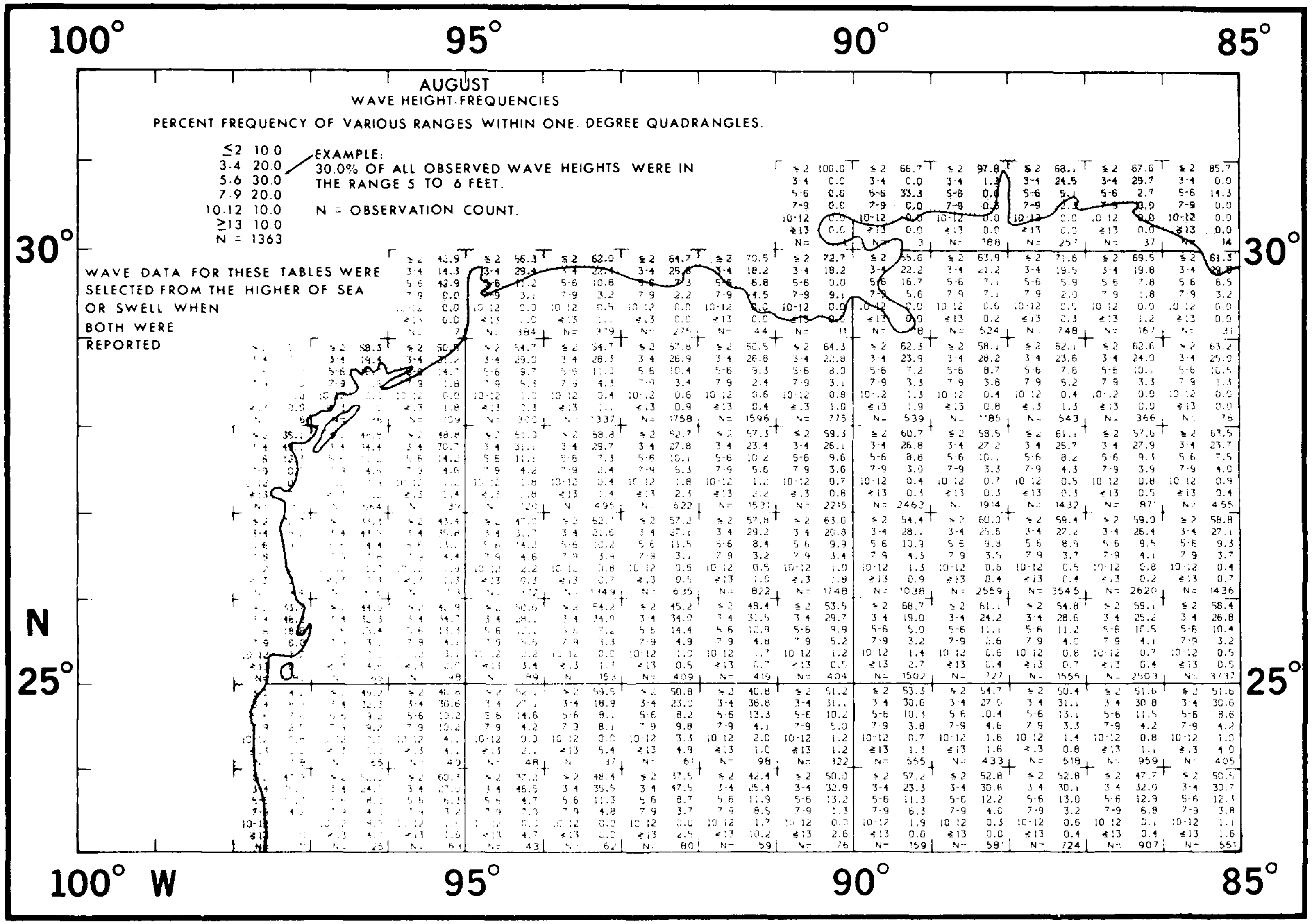
AUGUST
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM THE NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
100°
95°
90°
85°
30°
N
25°
100° W

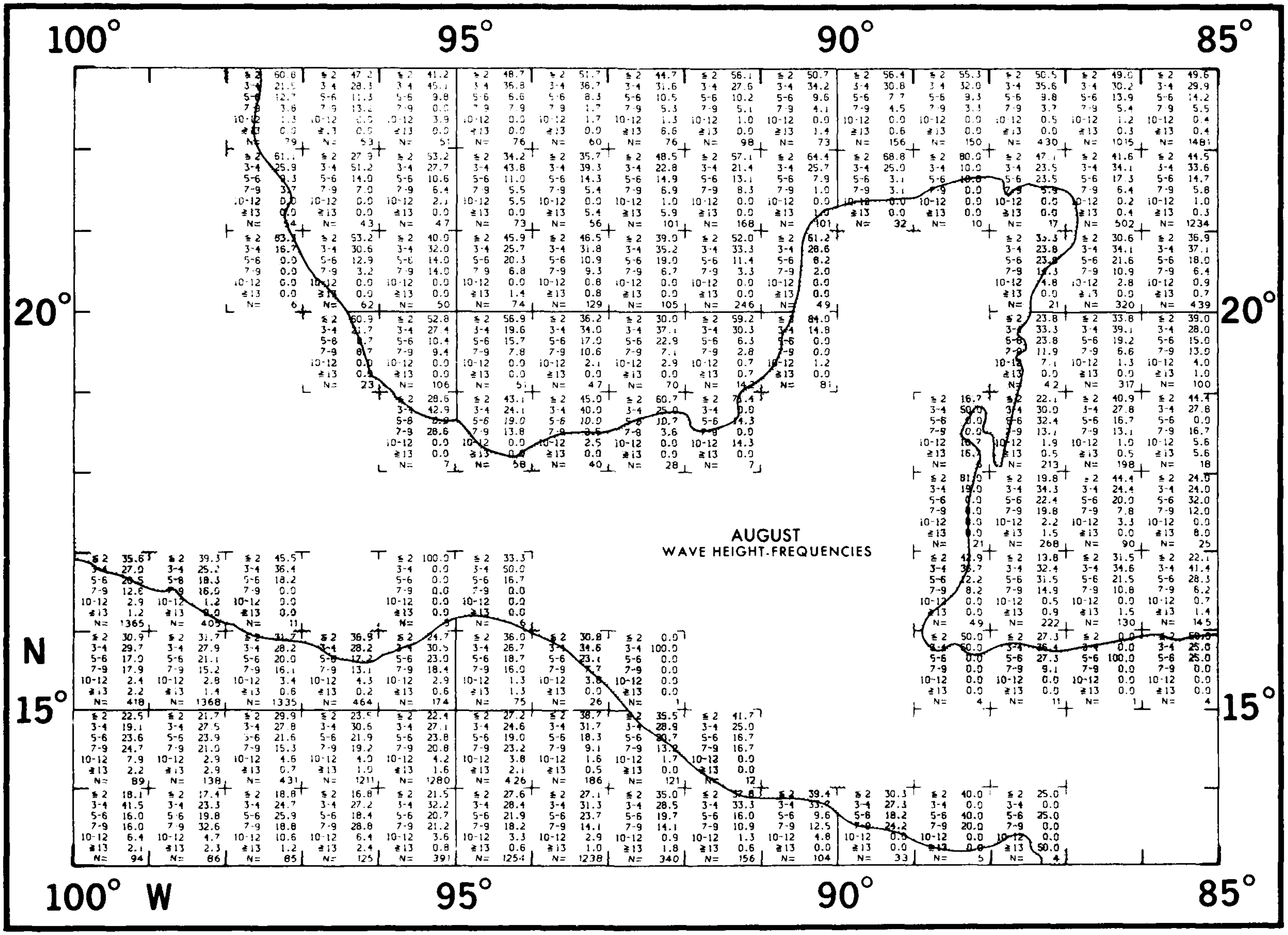

AUGUST
SURFACE WIND ROSE
85°
90°
95°
100° W
20°
15°
N

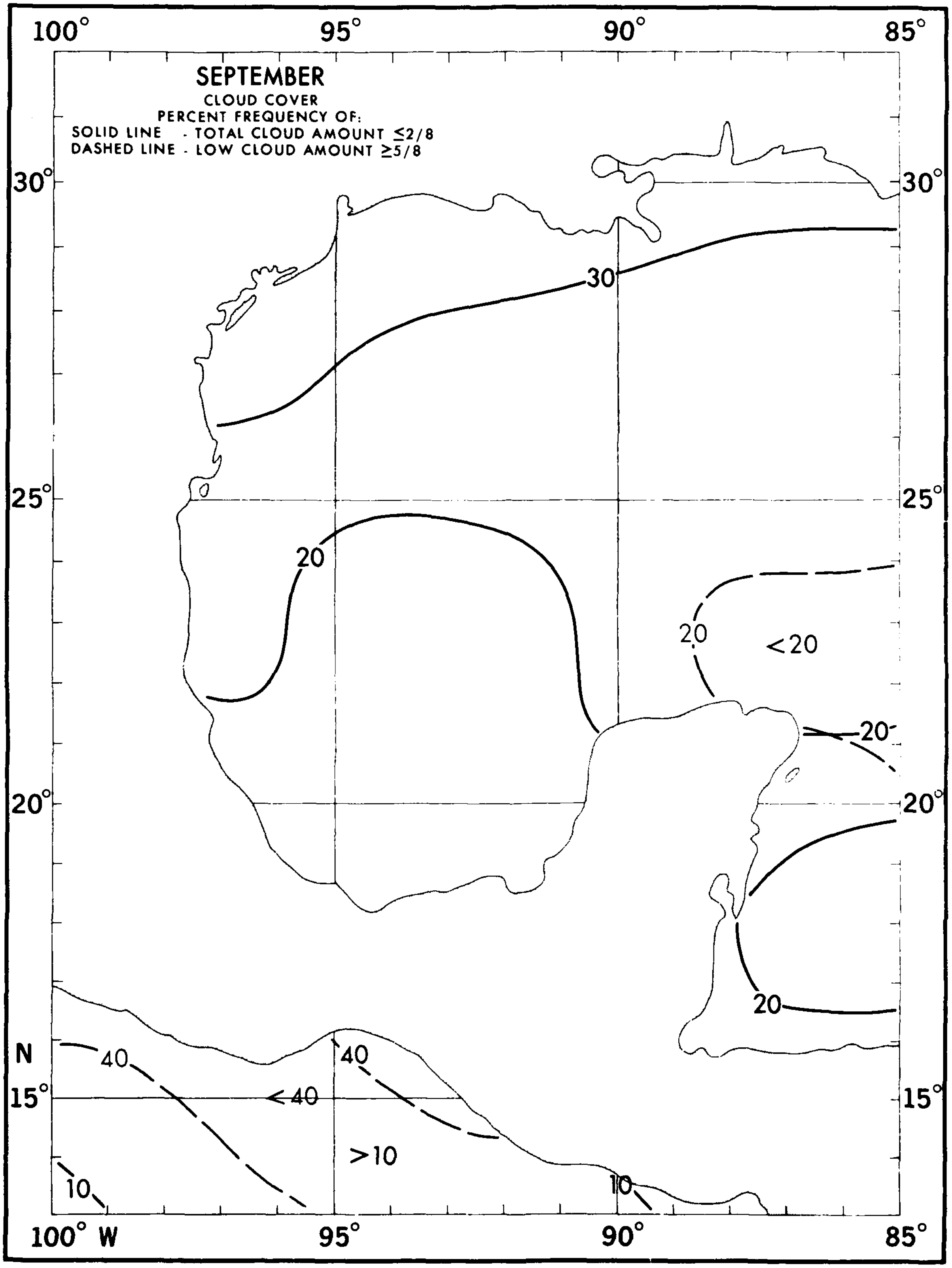


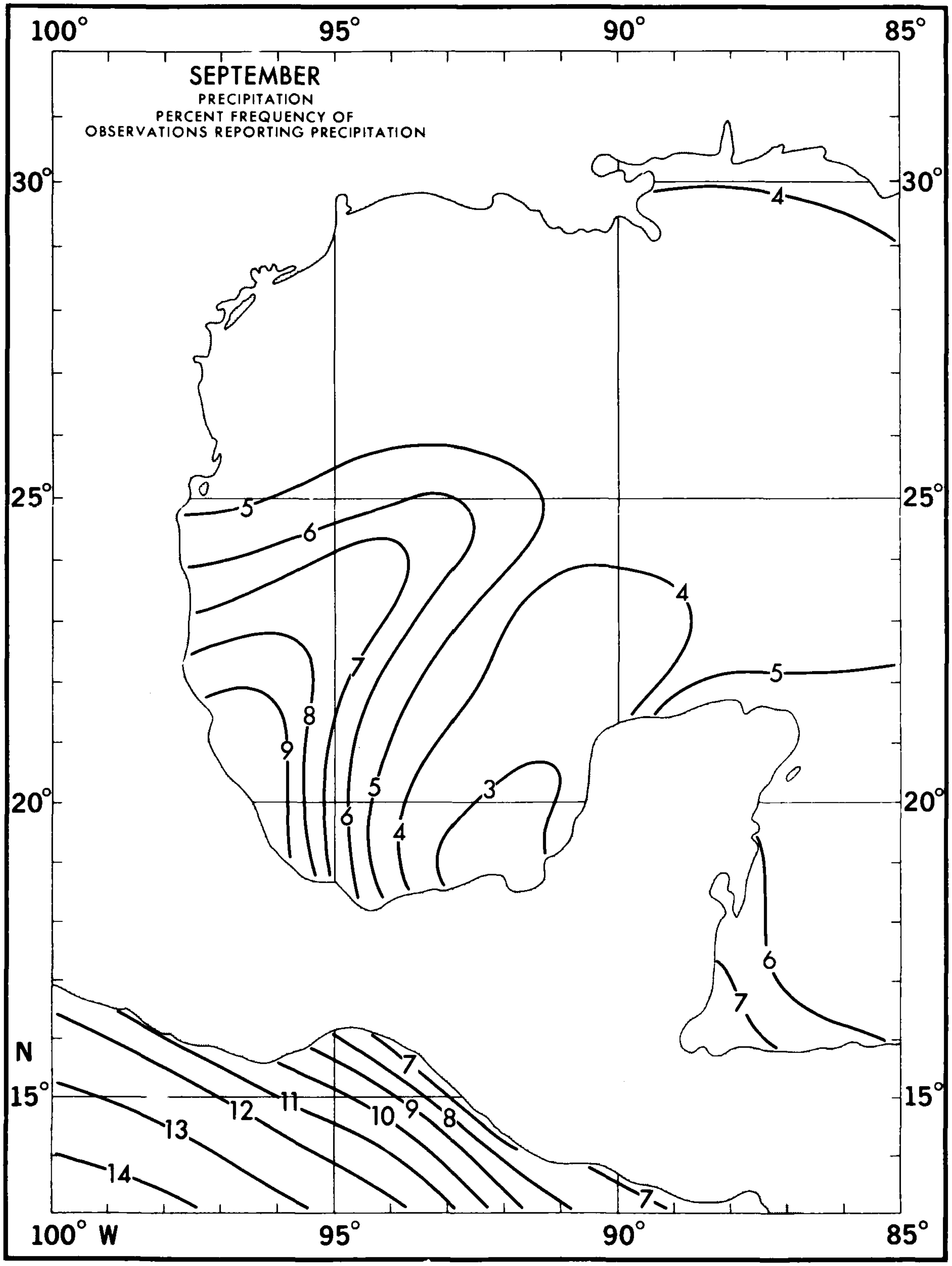
AUGUST
AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
86
83
85
84
84
83
>85
85
>83

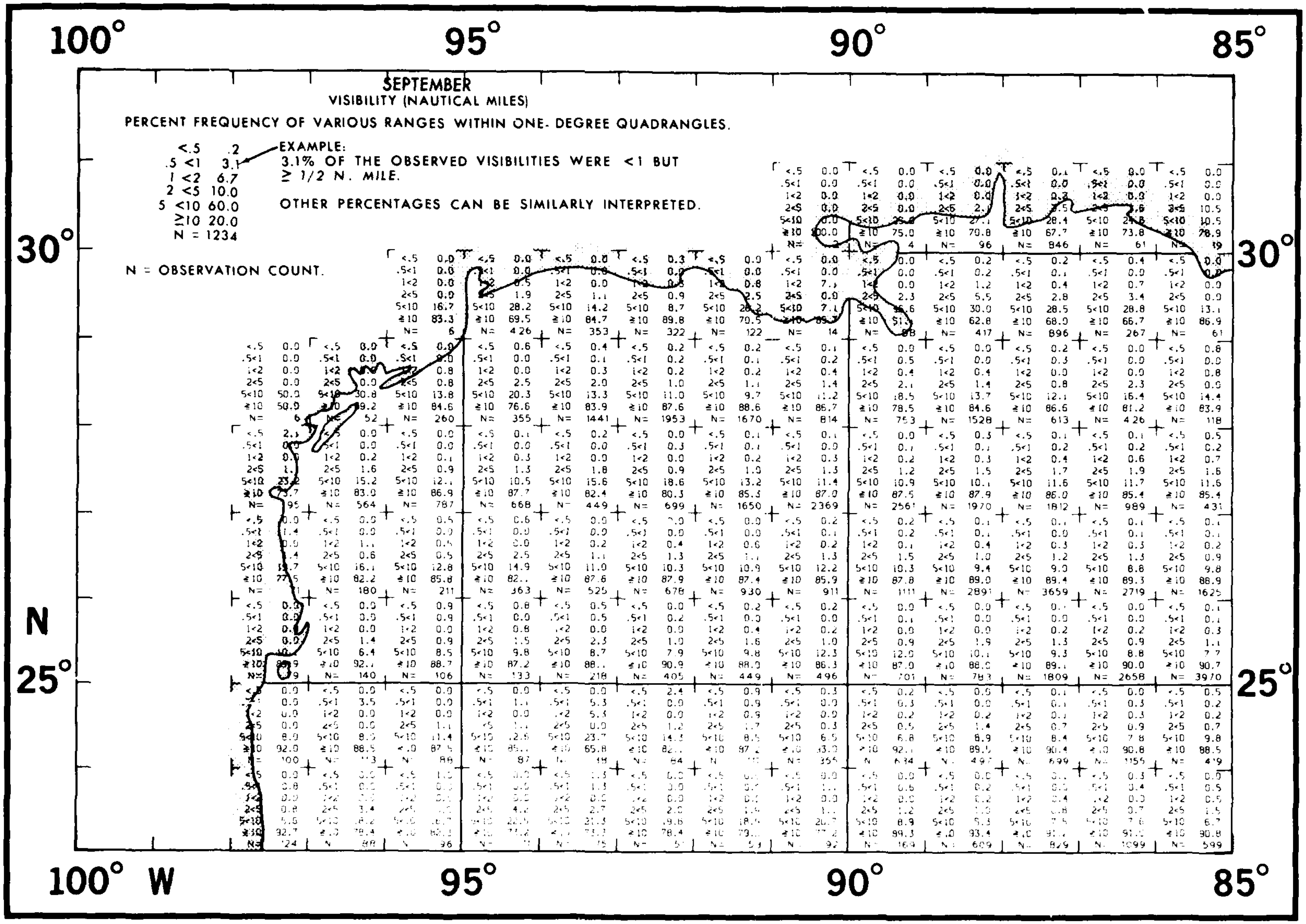

AUGUST
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
SOLID LINE - WAVE HEIGHT ≥3 FEET
DASHED LINE - WAVE HEIGHT ≥8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS.
SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
30
40
50
<10
60
70
80
>10
10

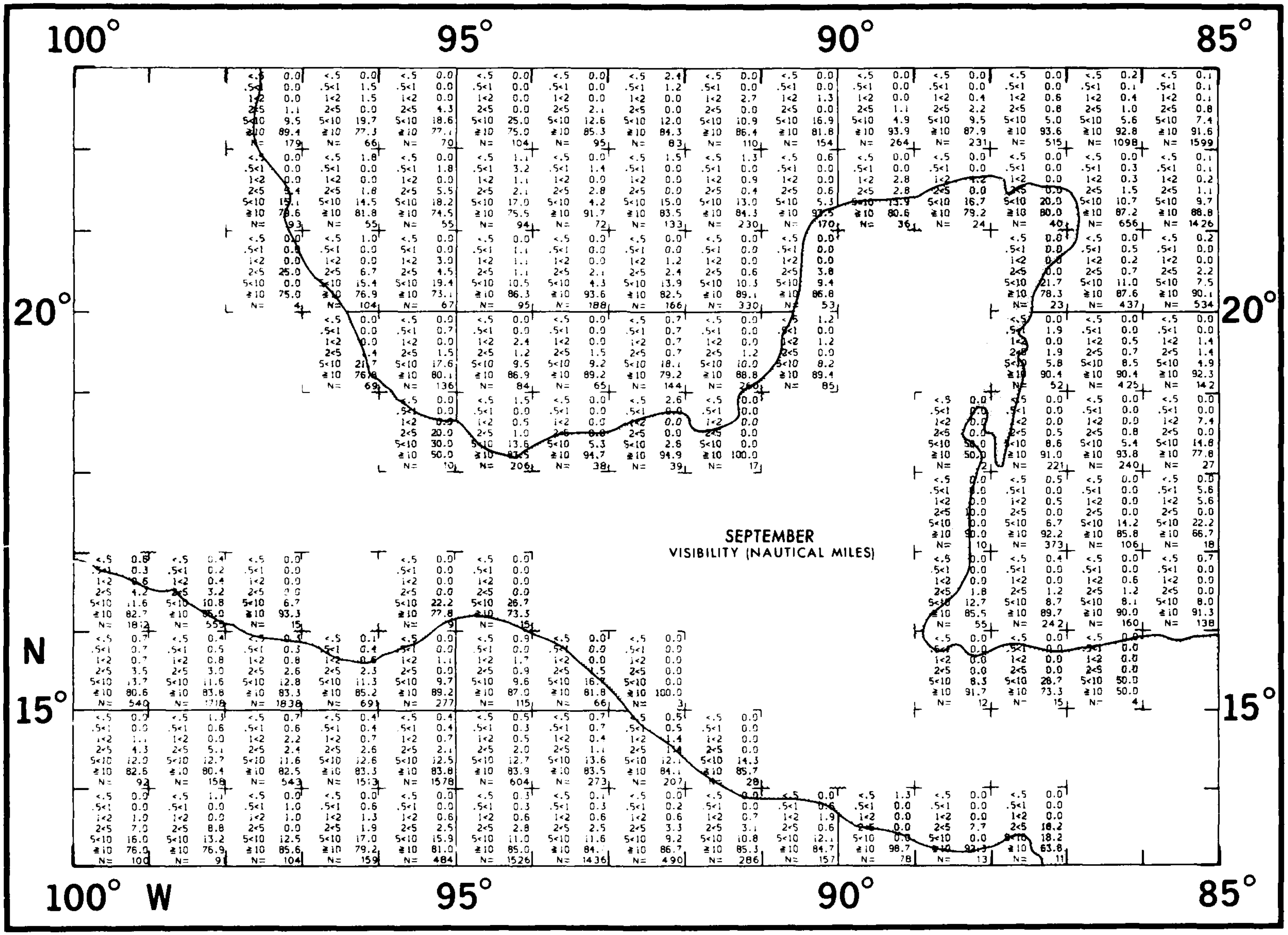

AUGUST
WAVE HEIGHT FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE DEGREE QUADRANGLES.
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
EXAMPLE:
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED
100°
95°
90°
85°
30°
25°
N
100° W

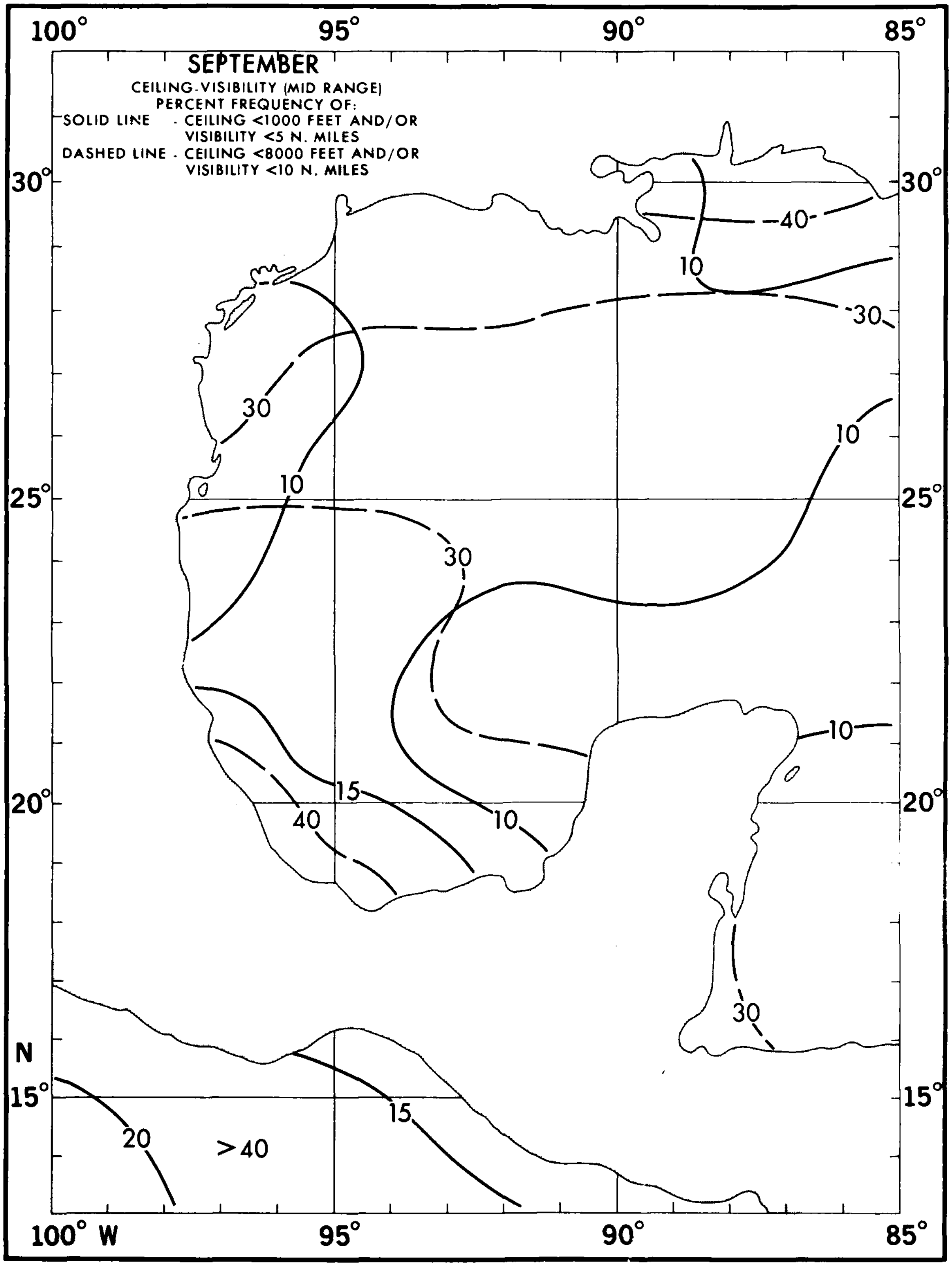

100°
95°
90°
85°
20°
20°
AUGUST
WAVE HEIGHT-FREQUENCIES
N
15°
15°
100° W
95°
90°
85°


SEPTEMBER
CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE - TOTAL CLOUD AMOUNT ≤2/8
DASHED LINE - LOW CLOUD AMOUNT ≥5/8
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
30
20
20
<20
20
20
40
40
<40
>10
10
10

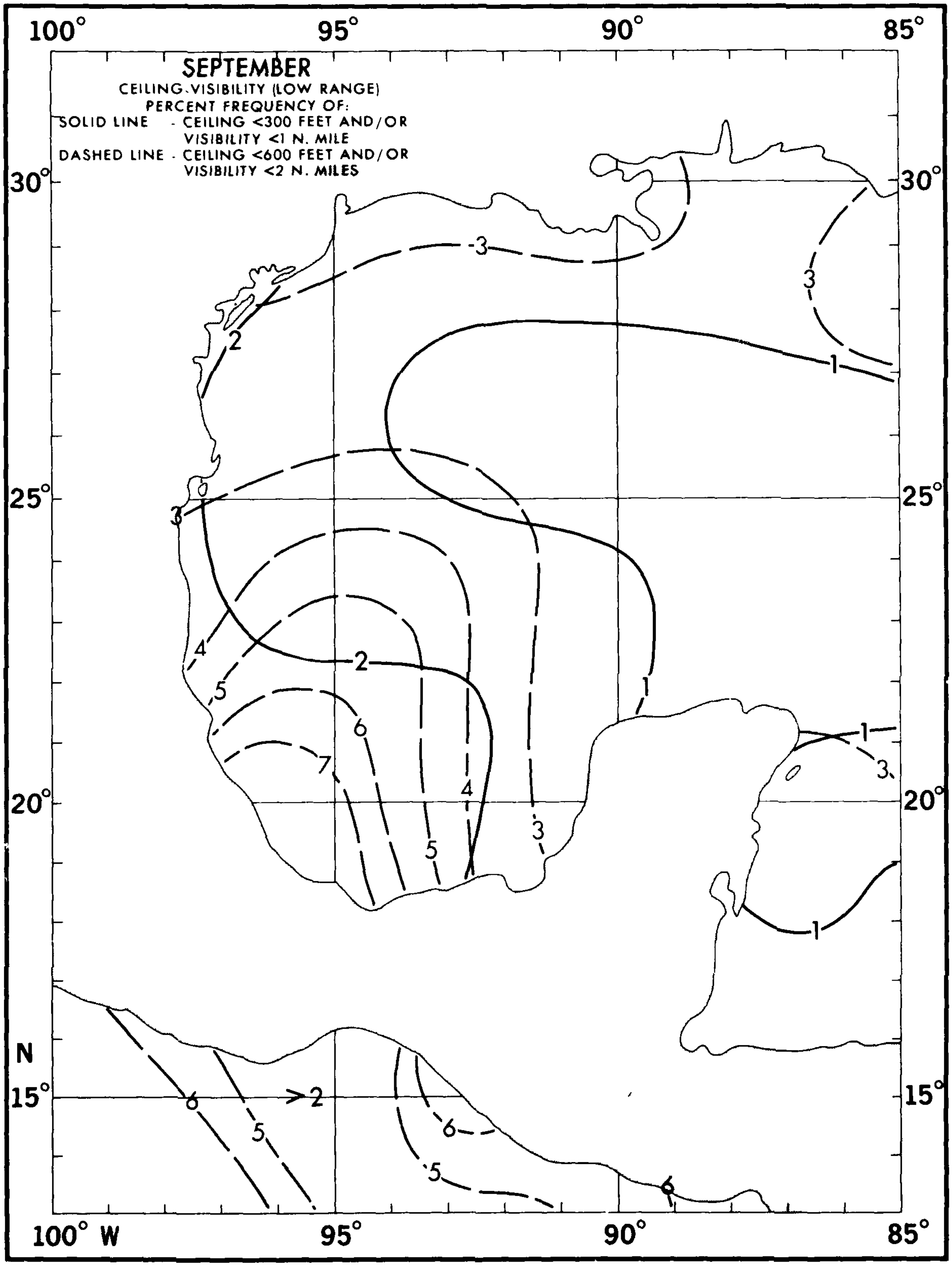

SEPTEMBER
PRECIPITATION
PERCENT FREQUENCY OF
OBSERVATIONS REPORTING PRECIPITATION
100°
95°
90°
85°
30°
25°
20°
N
15°
100° W
4
5
6
7
8
9
3
10
11
12
13
14

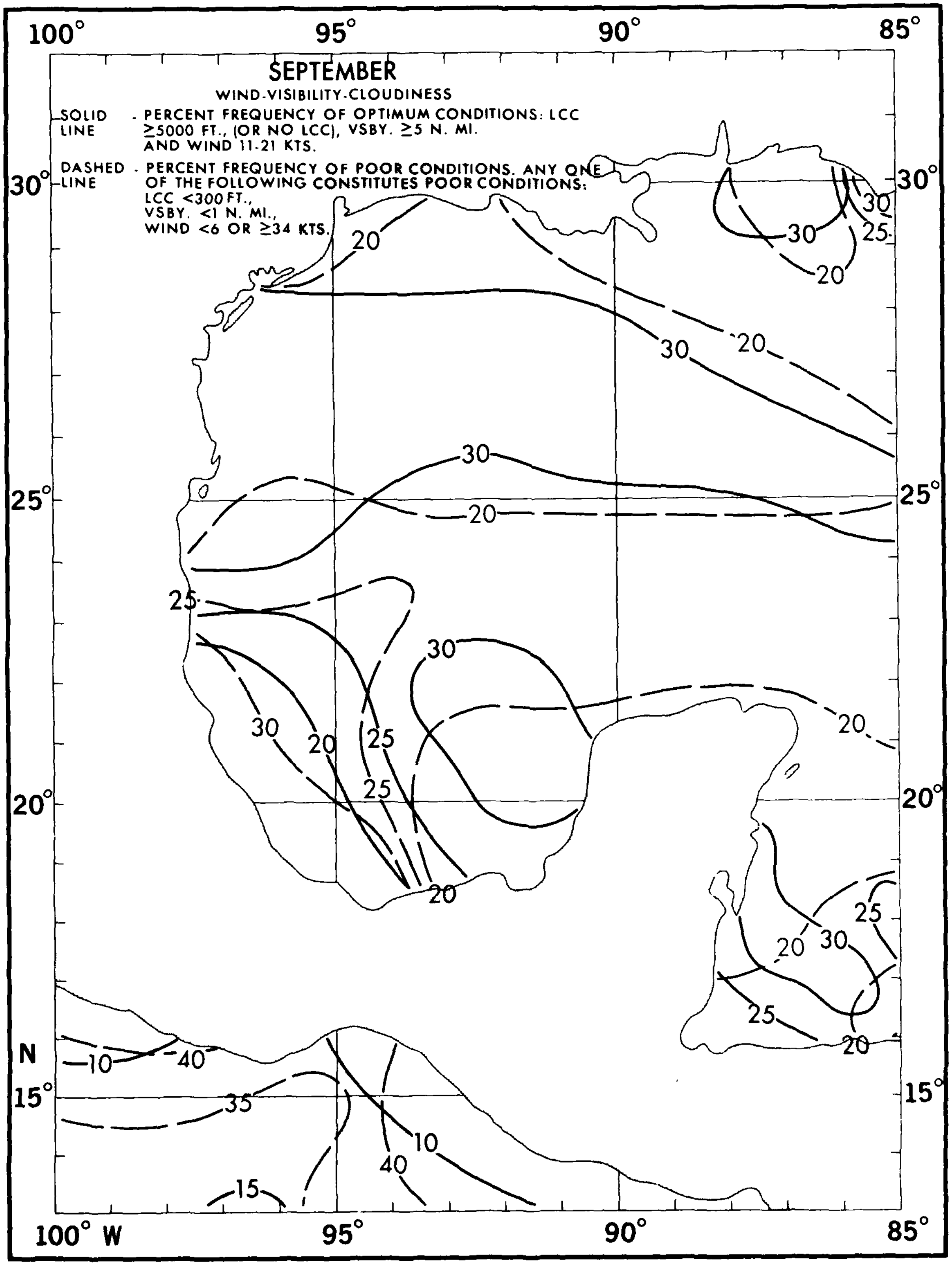

SEPTEMBER
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE- DEGREE QUADRANGLES.
<.5 .2
.5 <1 3.1
1 <2 6.7
2 <5 10.0
5 <10 60.0
≥10 20.0
N = 1234
EXAMPLE:
3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥ 1/2 N. MILE.
OTHER PERCENTAGES CAN BE SIMILARLY INTERPRETED.
N = OBSERVATION COUNT.
100°
95°
90°
85°
30°
25°
N
100° W

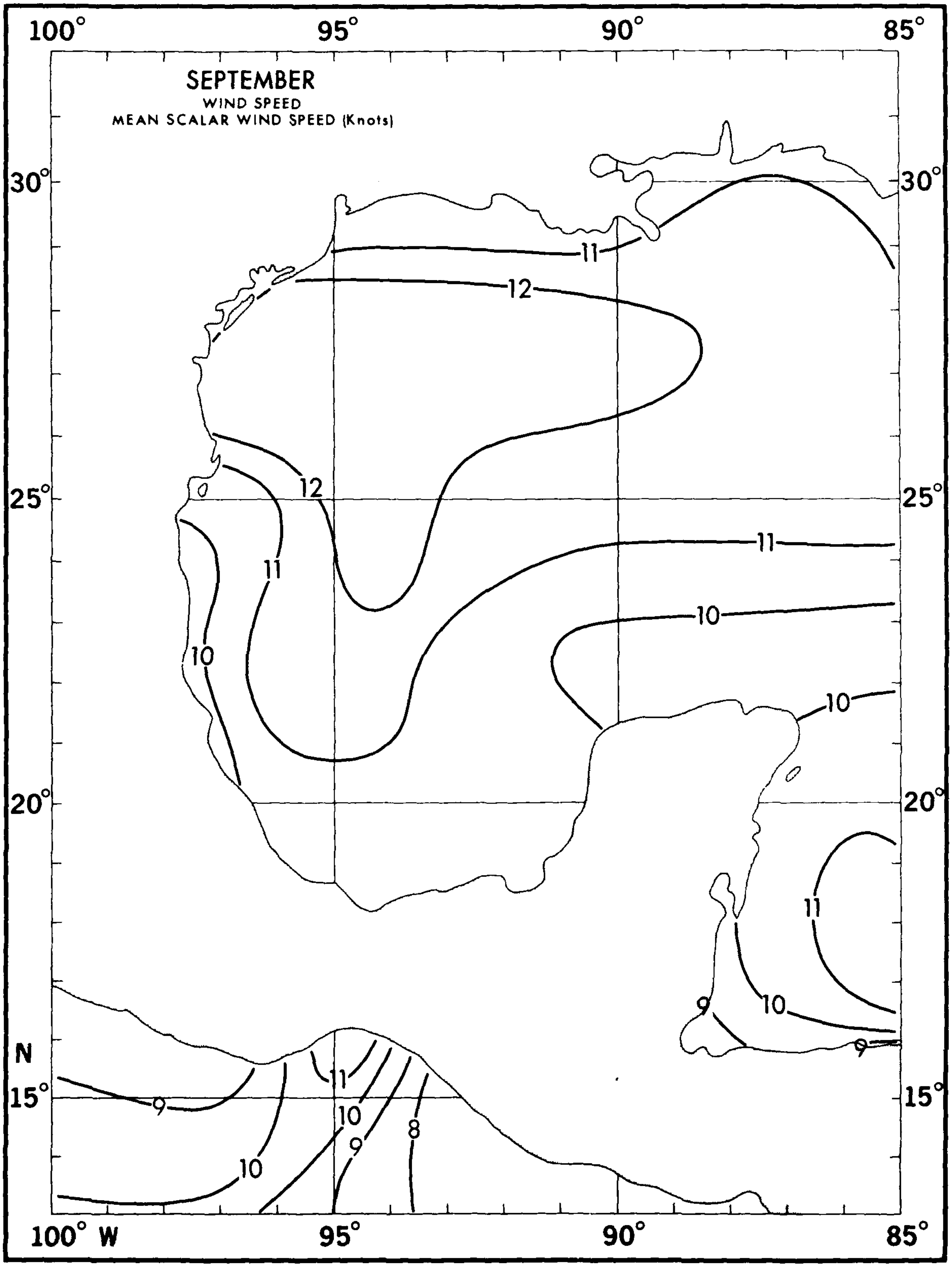

SEPTEMBER
VISIBILITY (NAUTICAL MILES)
100°
95°
90°
85°
20°
15°
N
100° W

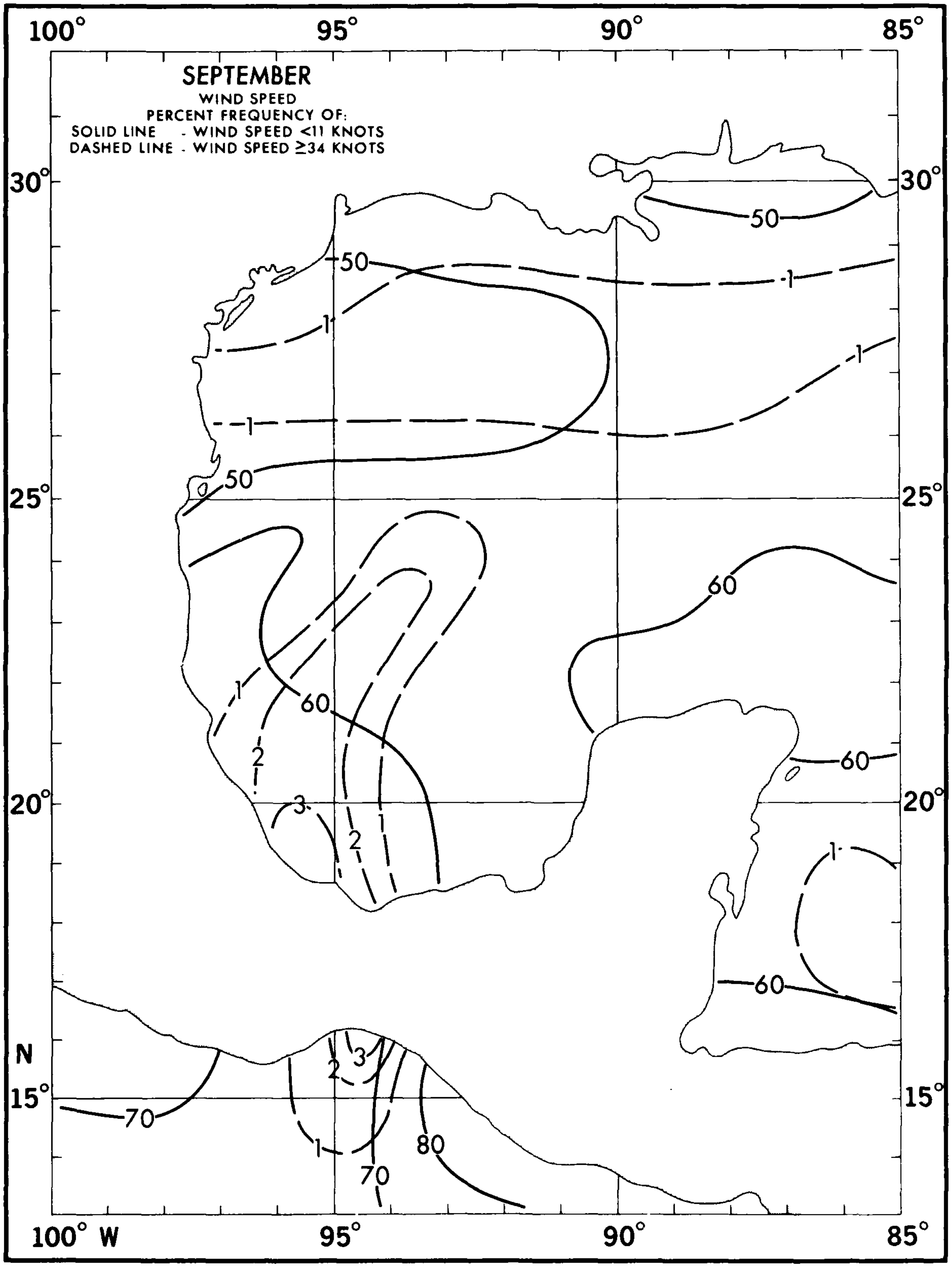


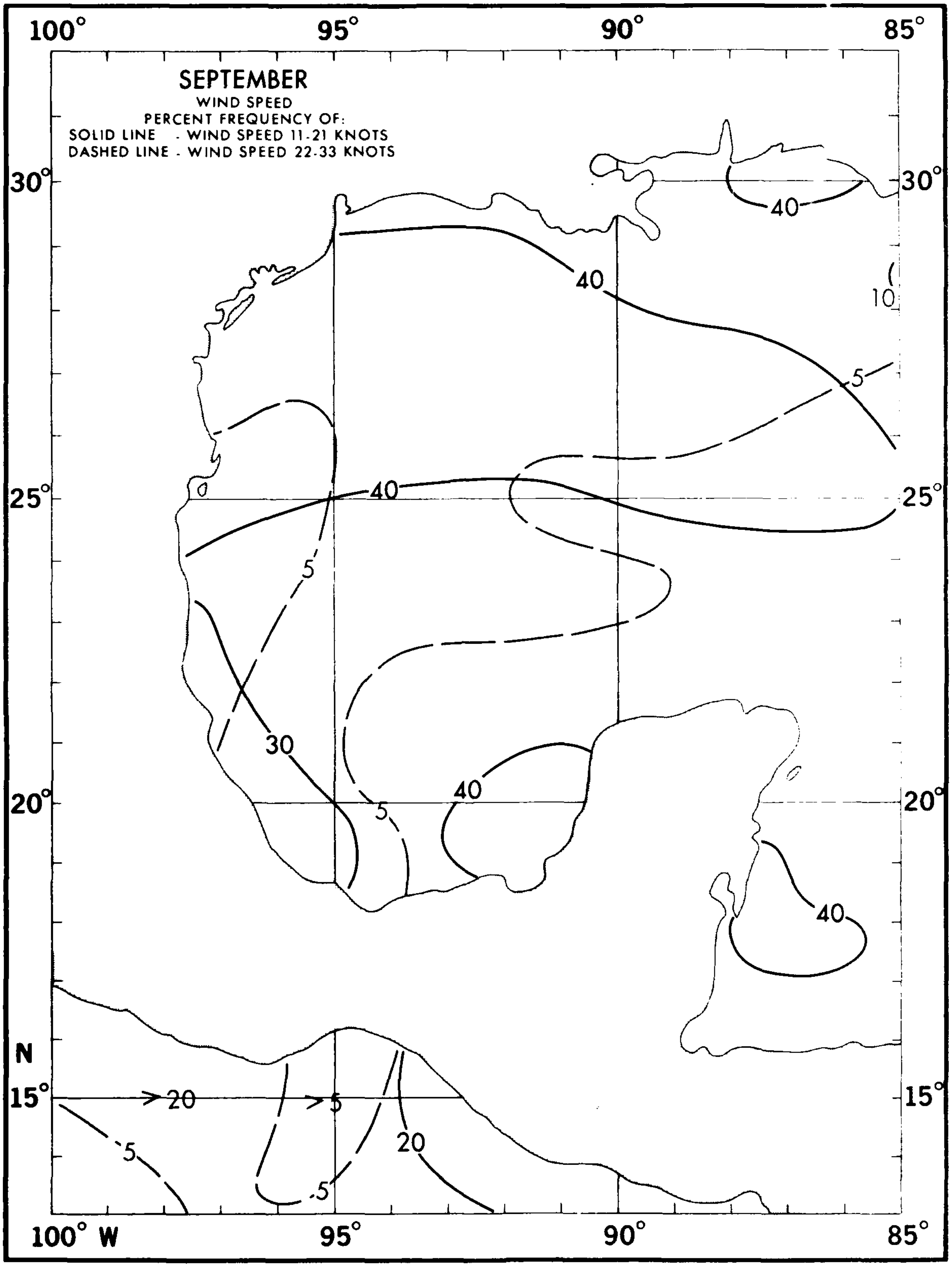
SEPTEMBER
CEILING-VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES
DASHED LINE - CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
40
30
10
15
20
>40


SEPTEMBER
CEILING-VISIBILITY (LOW RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <300 FEET AND/OR VISIBILITY <1 N. MILE
DASHED LINE - CEILING <600 FEET AND/OR VISIBILITY <2 N. MILES
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
>2

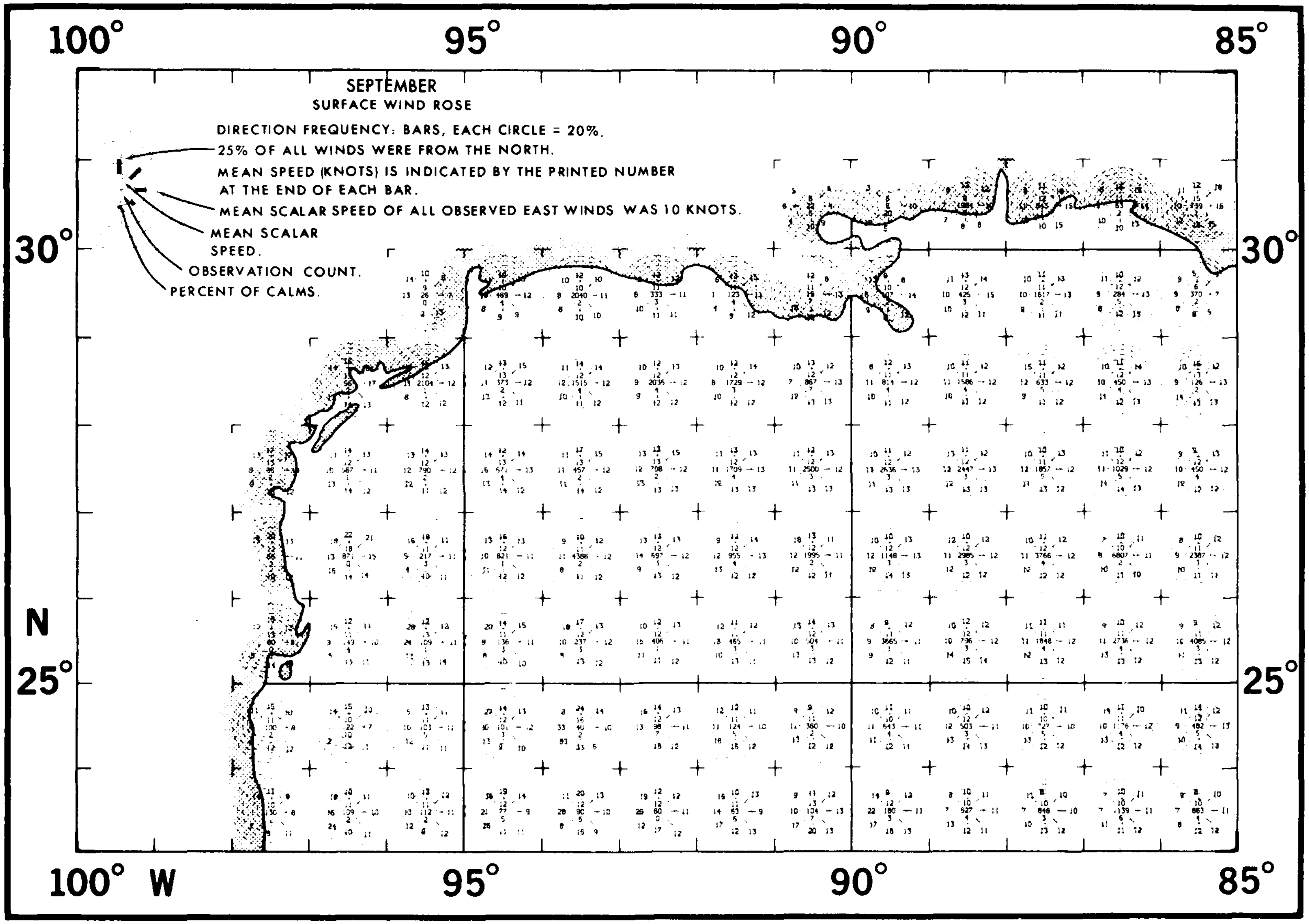

SEPTEMBER
WIND-VISIBILITY-CLOUDINESS
SOLID LINE - PERCENT FREQUENCY OF OPTIMUM CONDITIONS: LCC ≥5000 FT., (OR NO LCC), VSBY. ≥5 N. MI. AND WIND 11-21 KTS.
DASHED LINE - PERCENT FREQUENCY OF POOR CONDITIONS. ANY ONE OF THE FOLLOWING CONSTITUTES POOR CONDITIONS: LCC <300 FT., VSBY. <1 N. MI., WIND <6 OR ≥34 KTS.
100°
95°
90°
85°
30°
25°
20°
N 15°
100° W
20
30
25
10
40
35
15


SEPTEMBER
WIND SPEED
MEAN SCALAR WIND SPEED (Knots)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
12
11
10
9
8

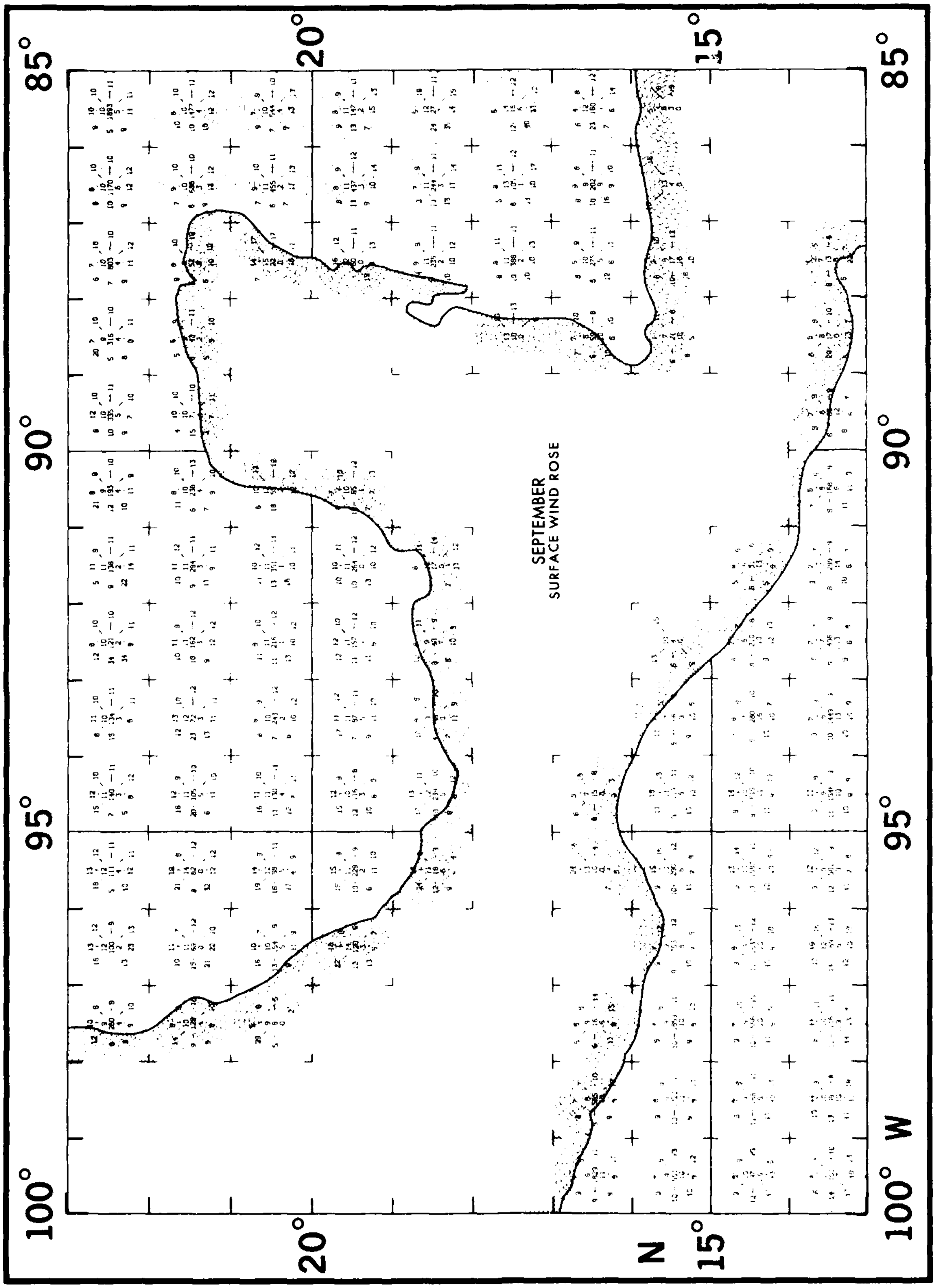

SEPTEMBER
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED <11 KNOTS
DASHED LINE - WIND SPEED ≥34 KNOTS
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
50
1
60
2
3
70
80

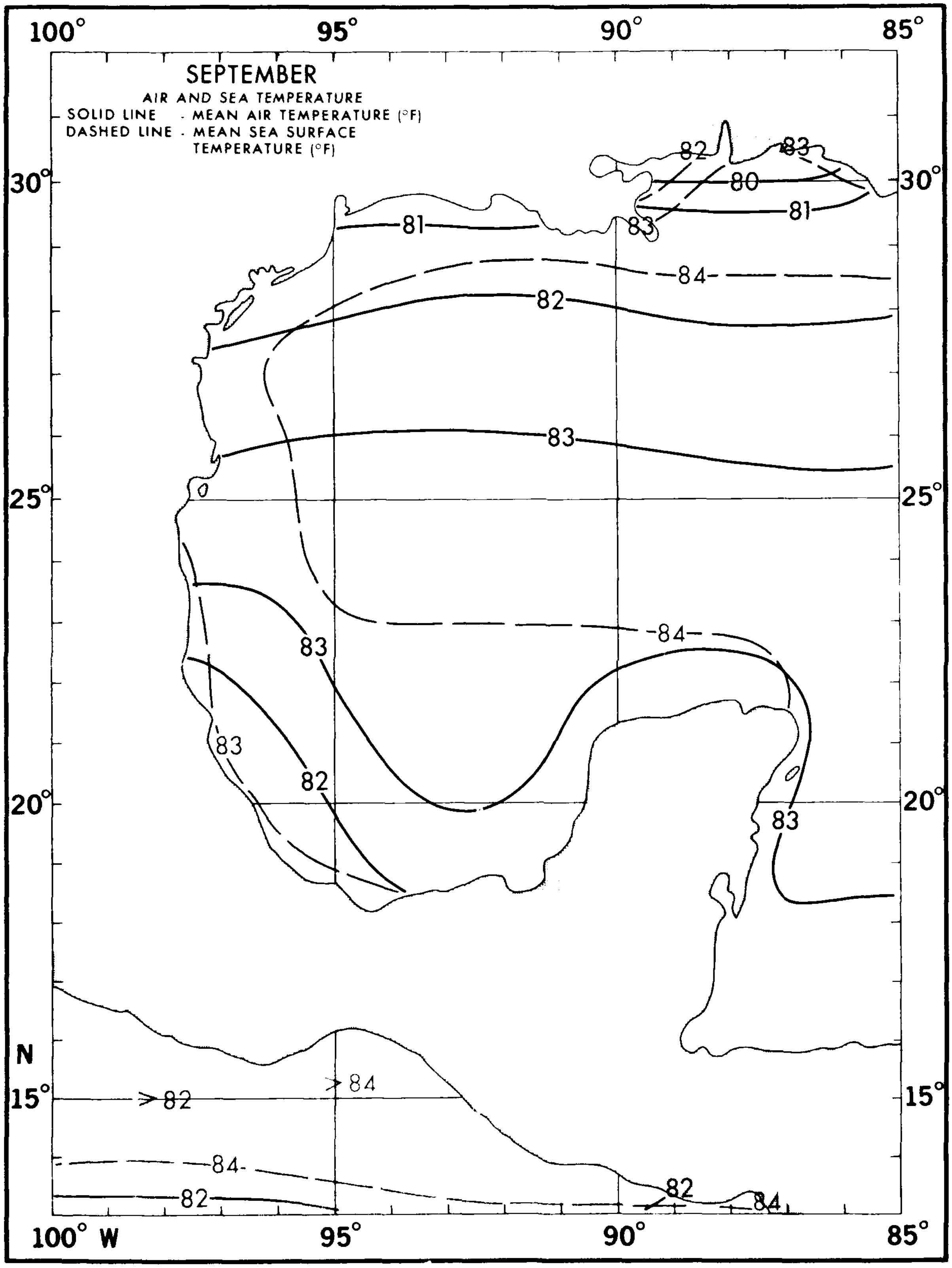


SEPTEMBER
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED 11-21 KNOTS
DASHED LINE - WIND SPEED 22-33 KNOTS
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
40
5
10
30
20

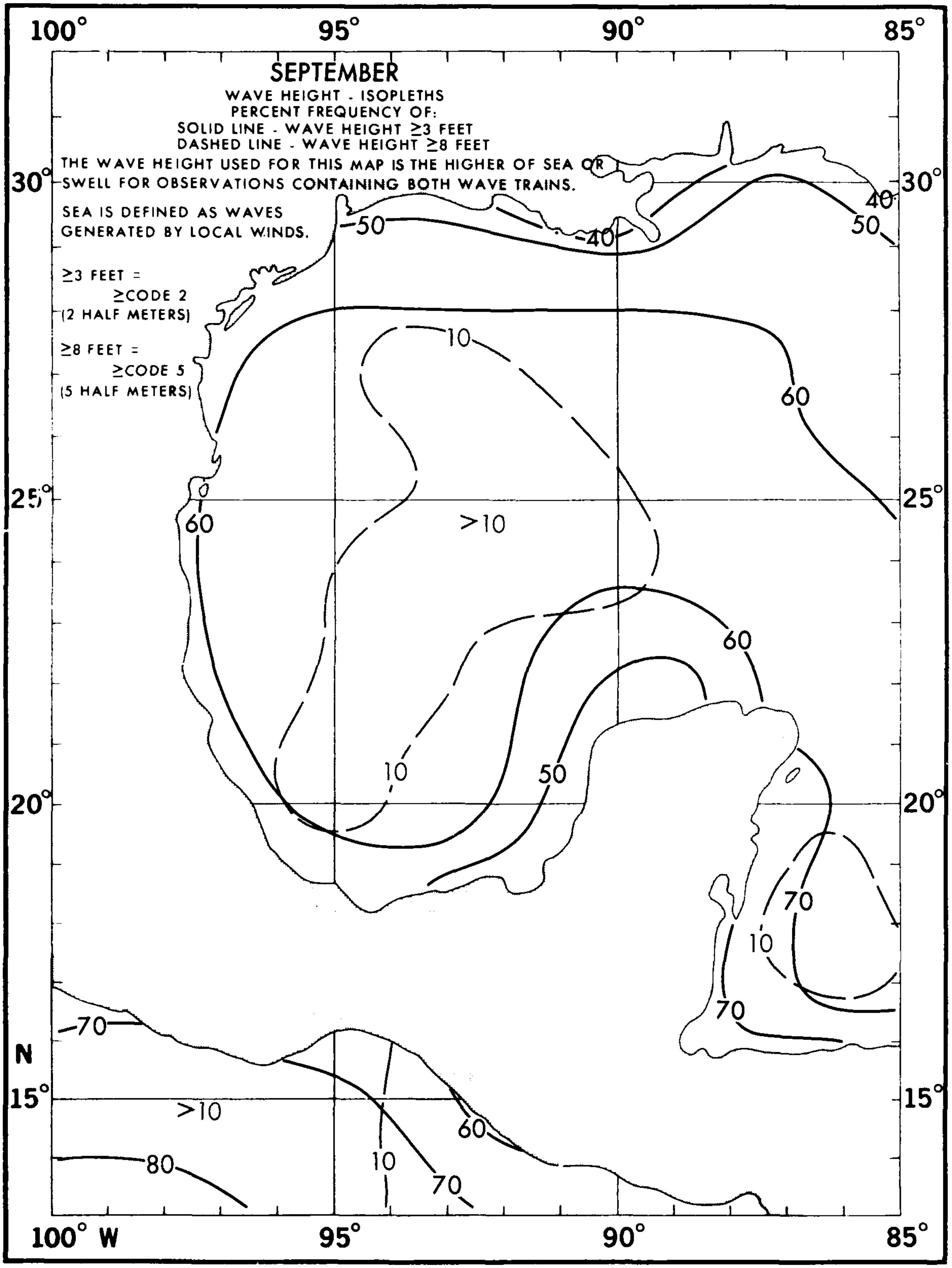


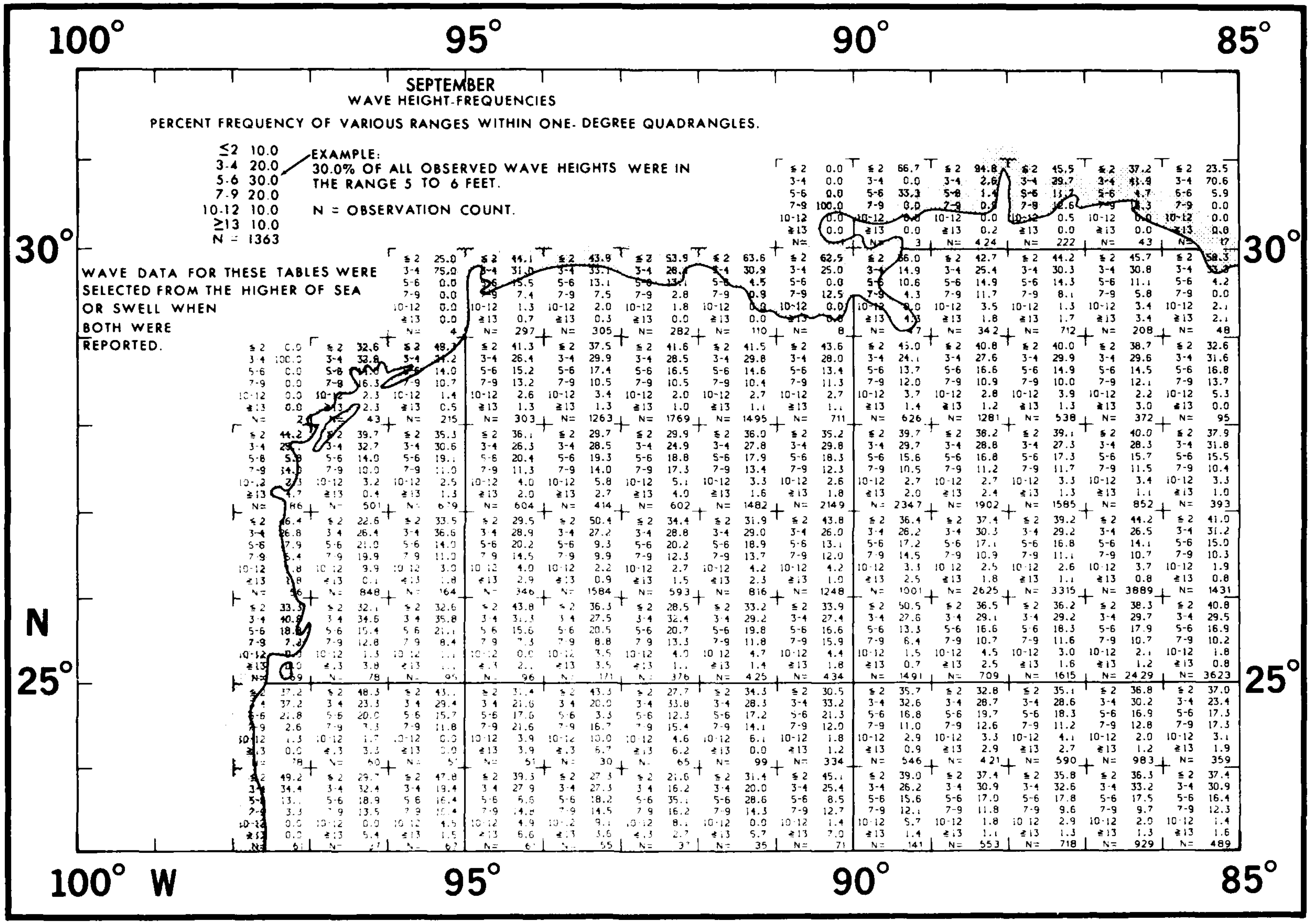
SEPTEMBER
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM THE NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
100°
95°
90°
85°
30°
25°
N
100° W

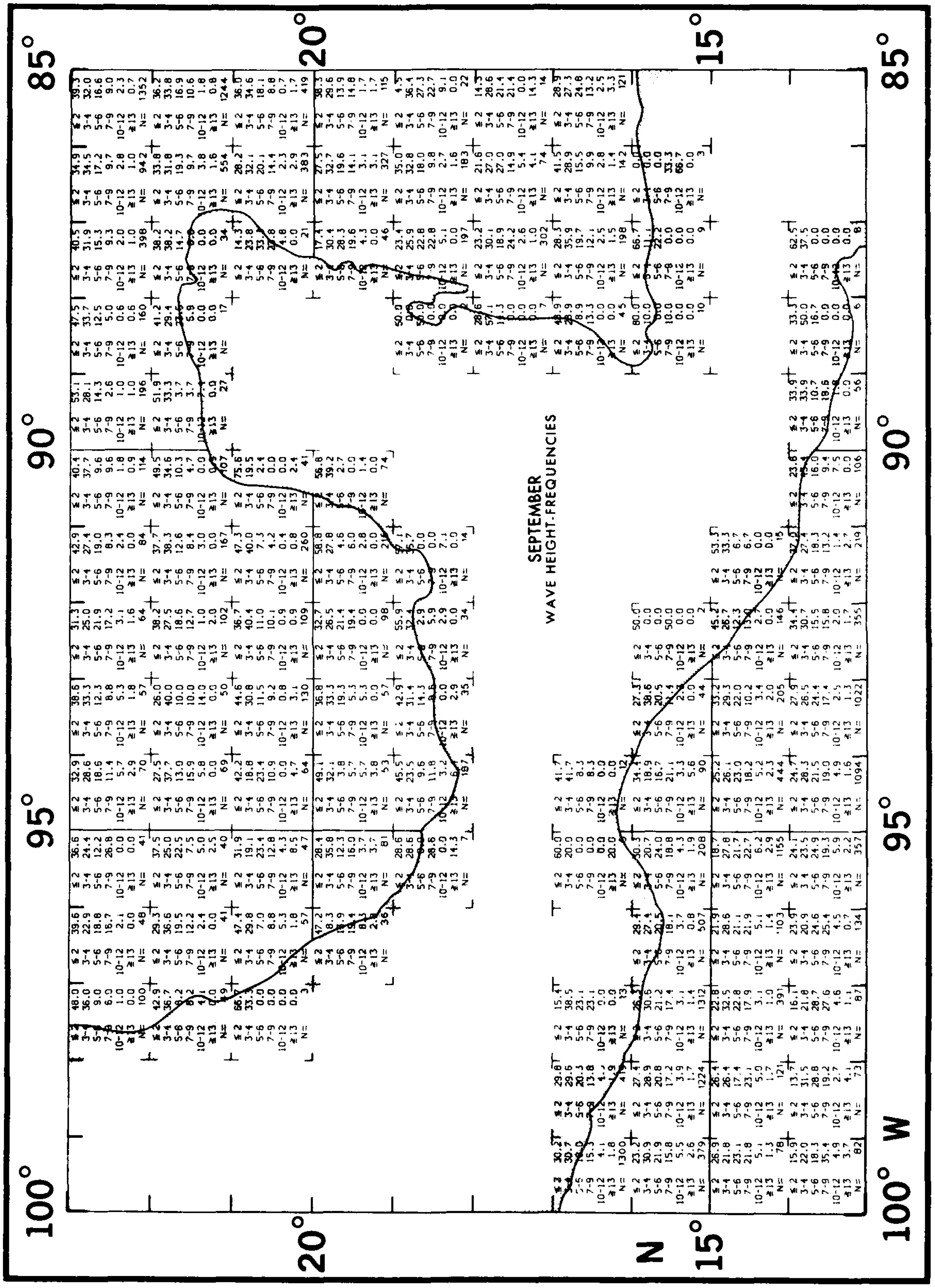

SEPTEMBER
SURFACE WIND ROSE
85°
90°
95°
100°
100° W
20°
15°
N

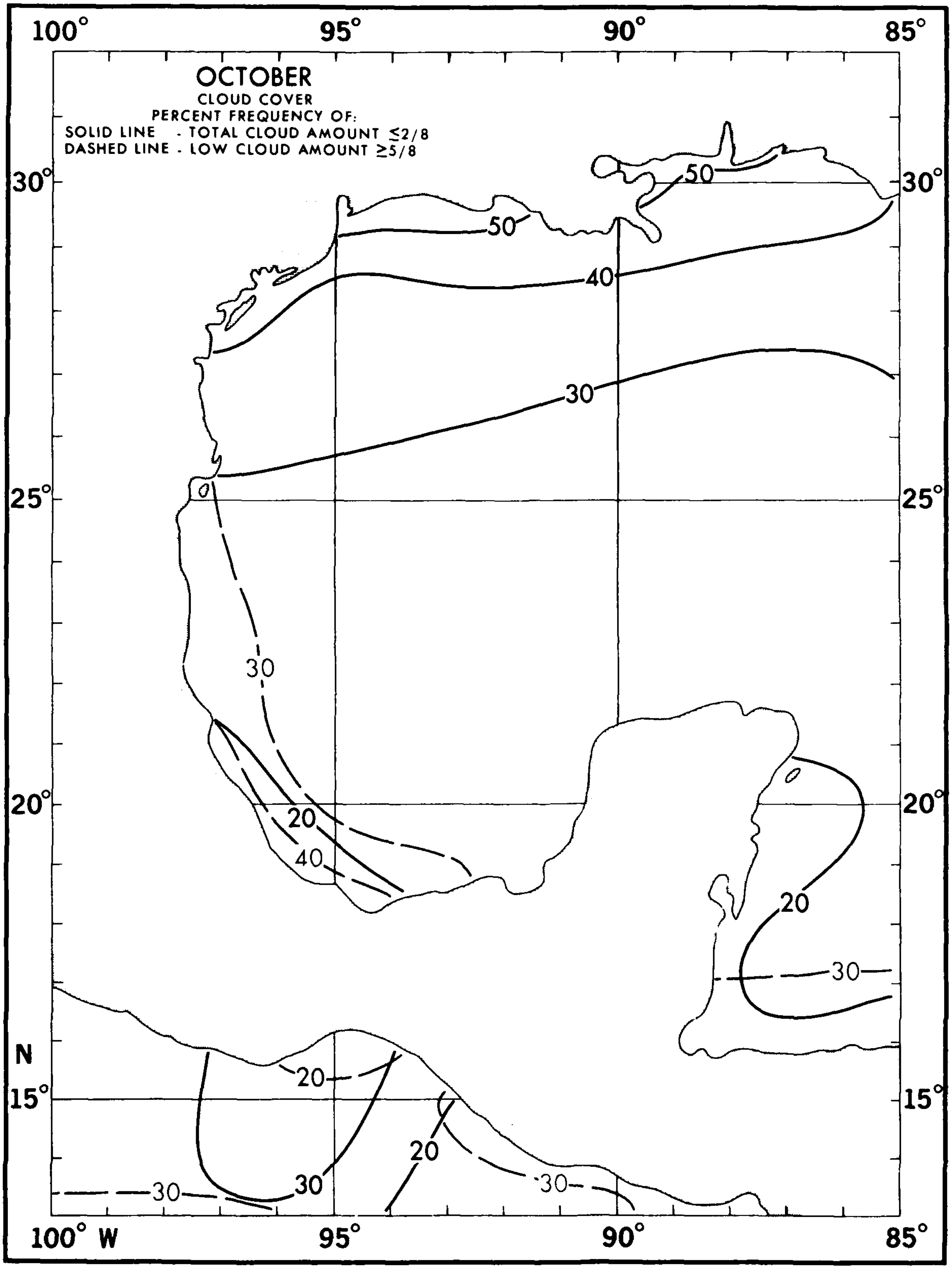


SEPTEMBER
AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
82
83
80
81
83
81
84
82
83
84
83
83
82
83
82
84
84
82
82
84

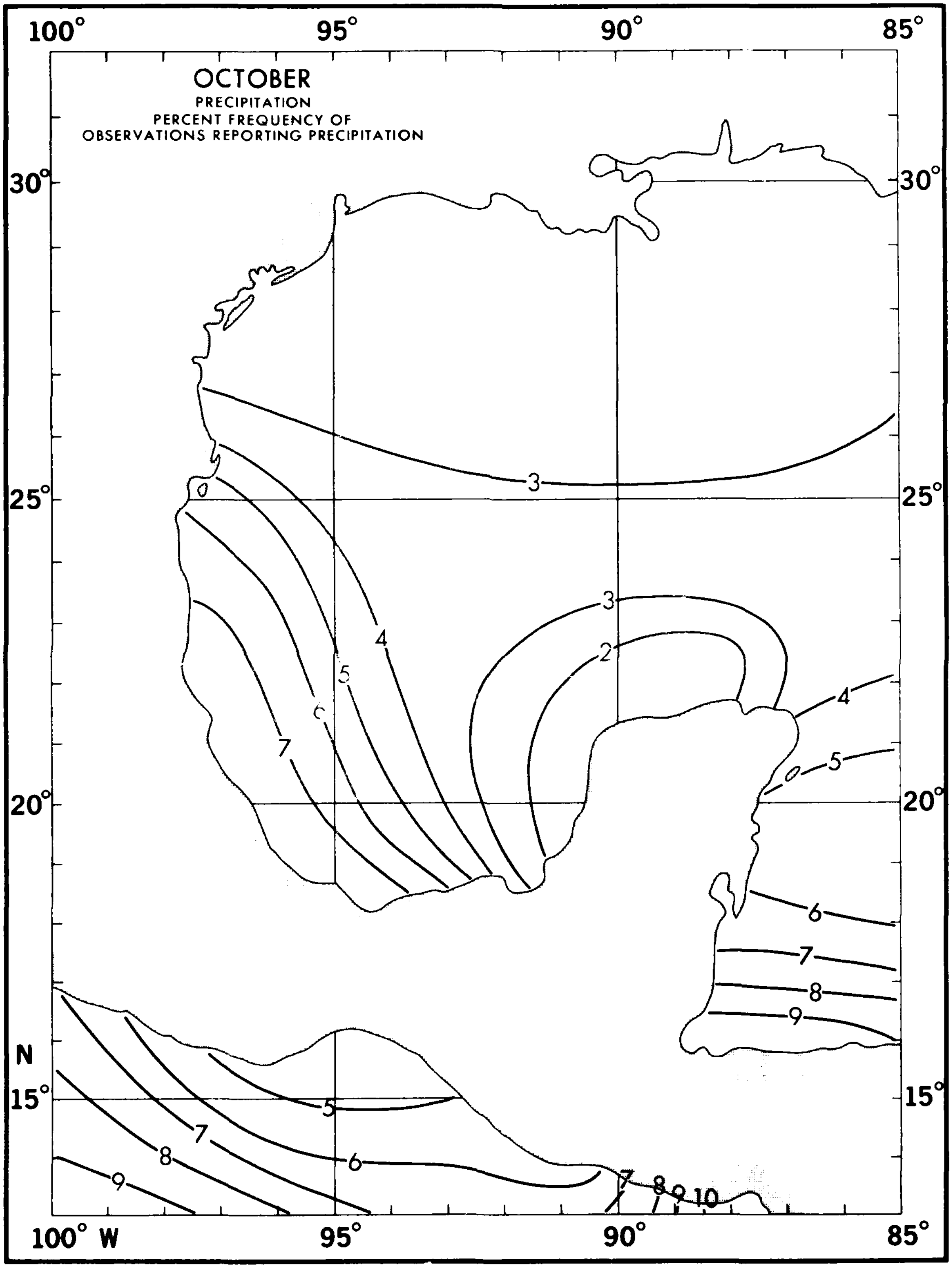

SEPTEMBER
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
SOLID LINE - WAVE HEIGHT ≥3 FEET
DASHED LINE - WAVE HEIGHT ≥8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS.
SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
50
40
60
10
>10
70
80

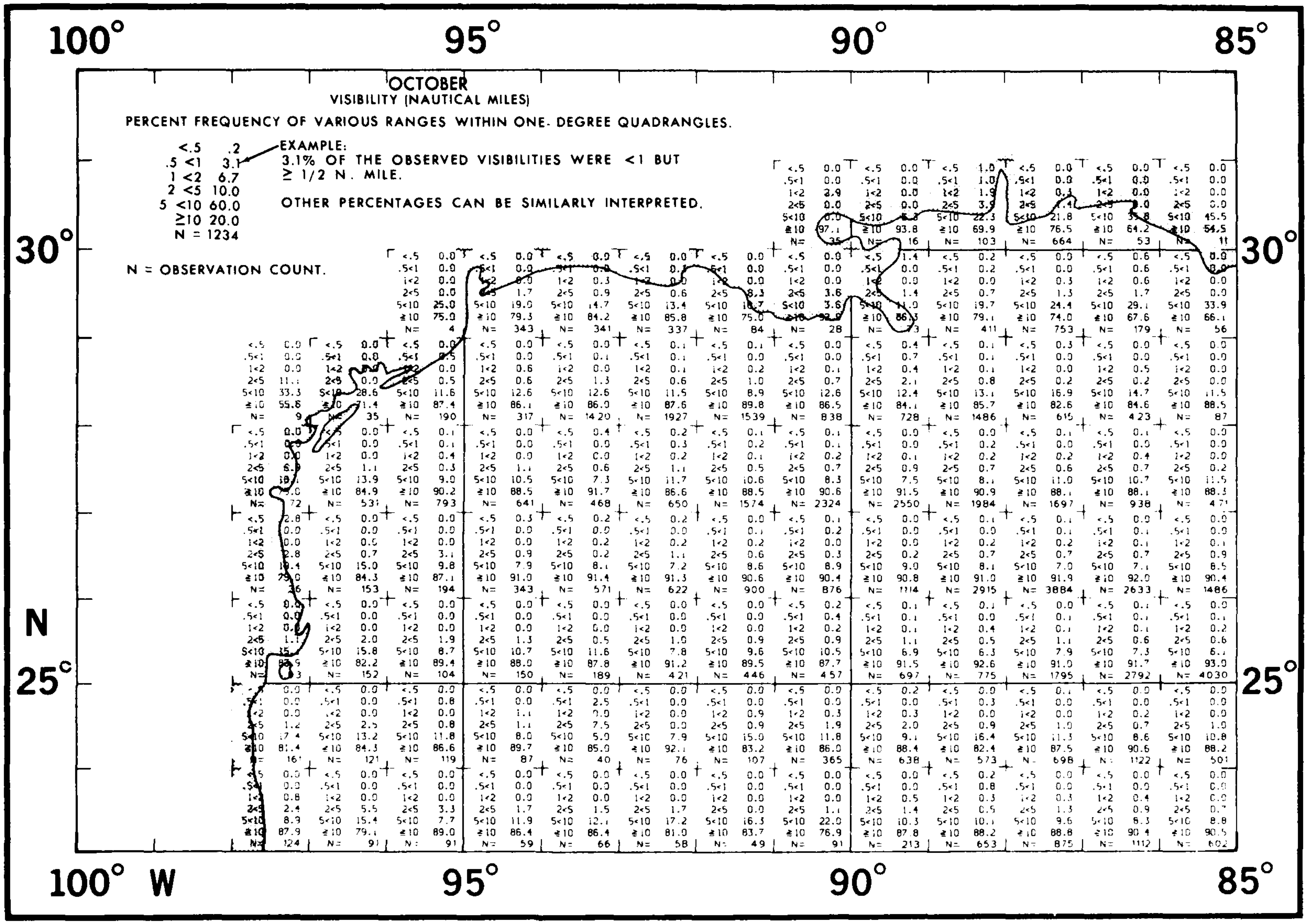

SEPTEMBER
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
EXAMPLE:
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
100°
95°
90°
85°
30°
25°
N
100° W

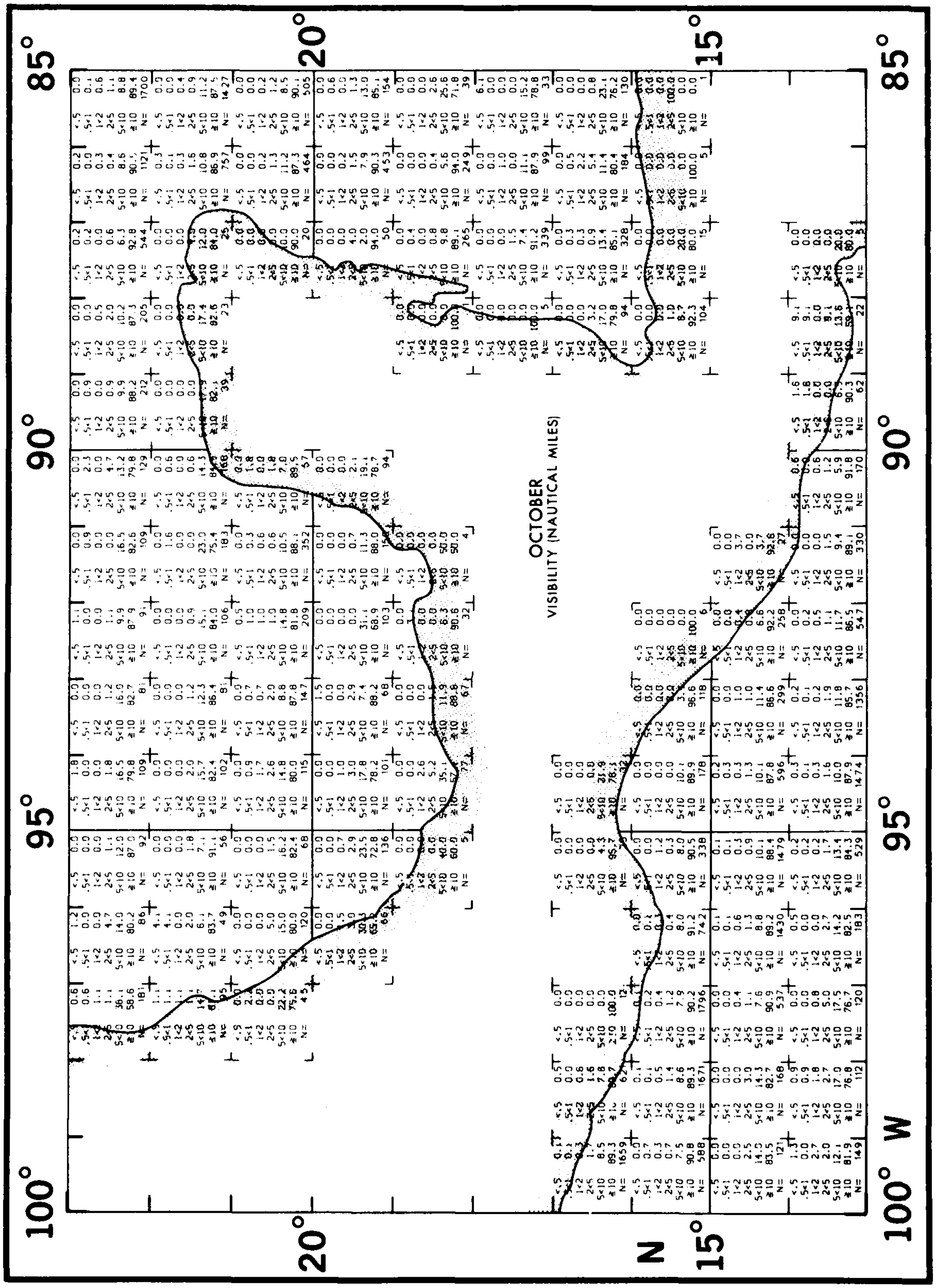

SEPTEMBER
WAVE HEIGHT FREQUENCIES
100° W
95°
90°
85°
20°
15°
N

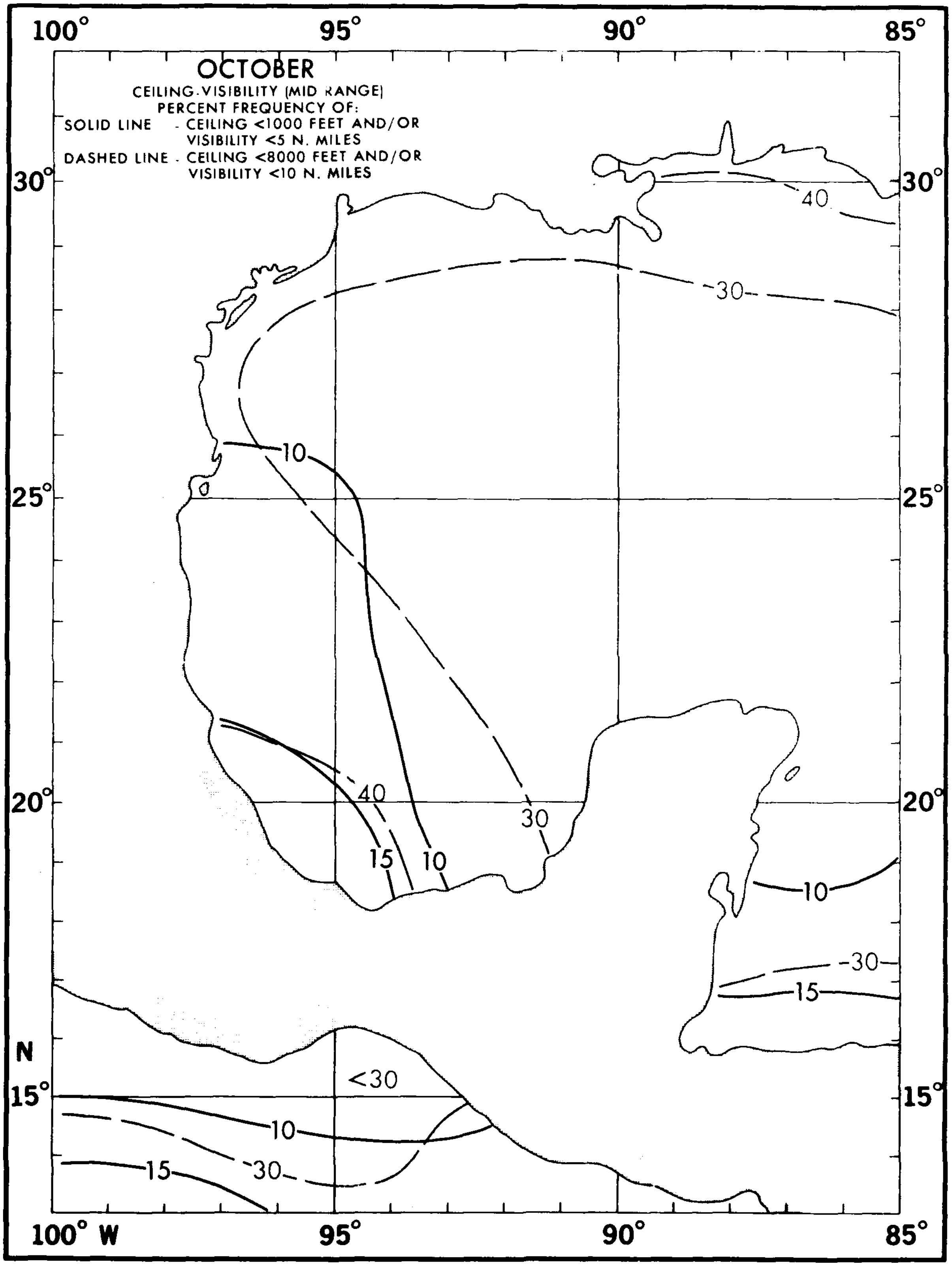


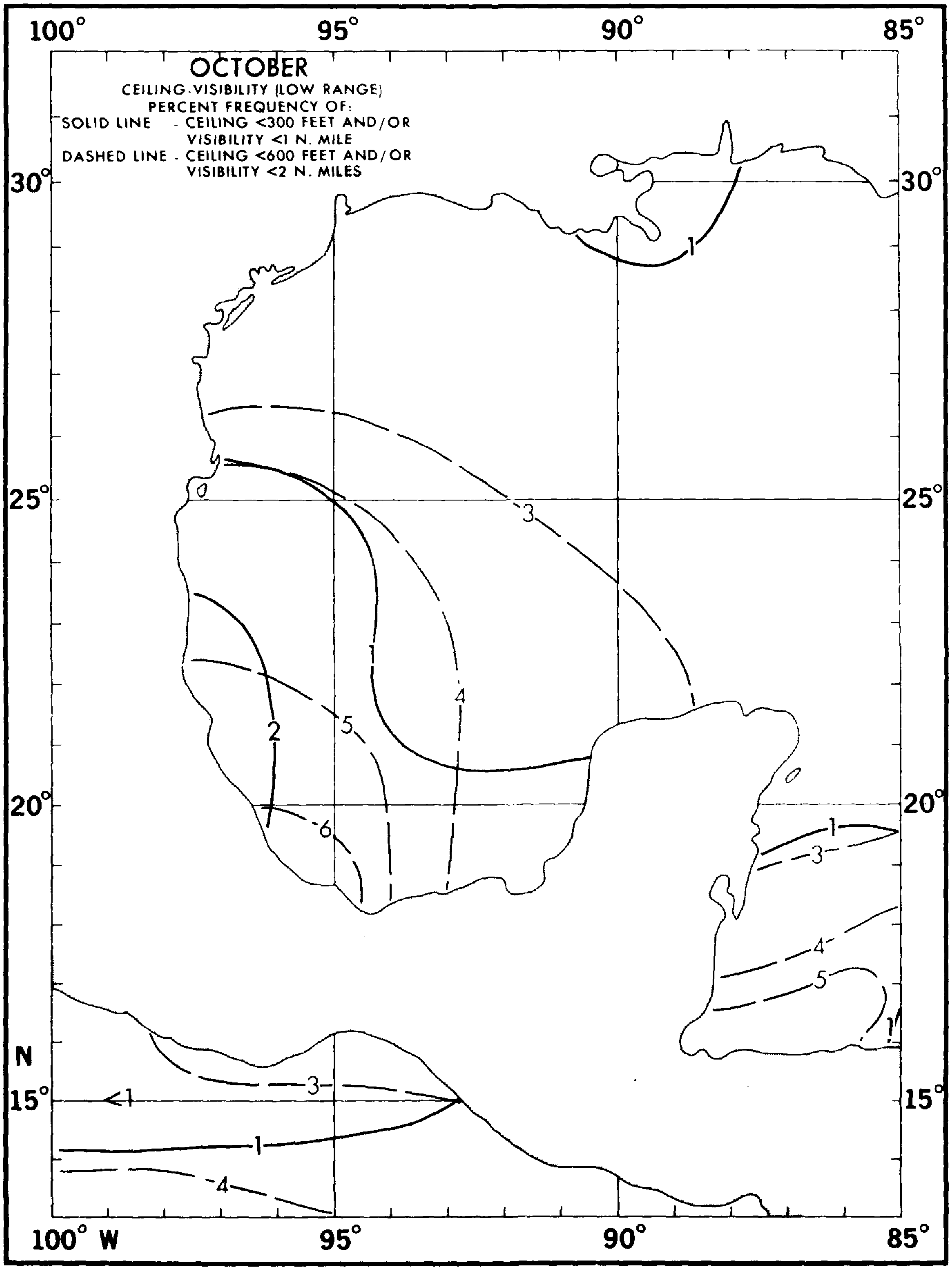
100°
95°
90°
85°
OCTOBER
CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE - TOTAL CLOUD AMOUNT ≤2/8
DASHED LINE - LOW CLOUD AMOUNT ≥5/8
30°
25°
20°
N
15°
50
40
30
20
100° W


OCTOBER
PRECIPITATION
PERCENT FREQUENCY OF
OBSERVATIONS REPORTING PRECIPITATION
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
3
4
5
6
7
2
8
9
10

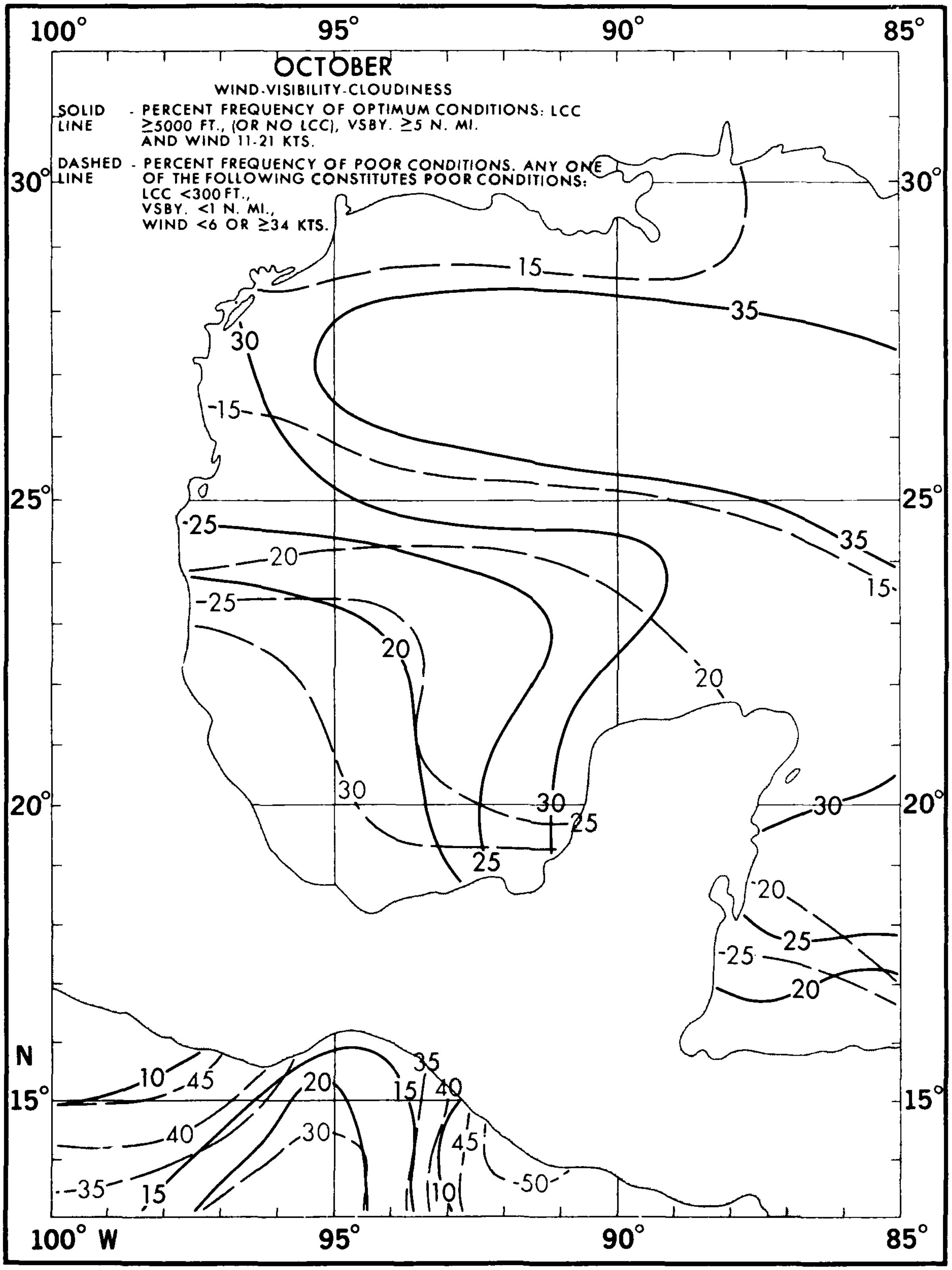

OCTOBER
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
<.5 .2
.5 <1 3.1
1 <2 6.7
2 <5 10.0
5 <10 60.0
≥10 20.0
N = 1234
EXAMPLE:
3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥ 1/2 N. MILE.
OTHER PERCENTAGES CAN BE SIMILARLY INTERPRETED.
N = OBSERVATION COUNT.
100°
95°
90°
85°
30°
25°
N
100° W

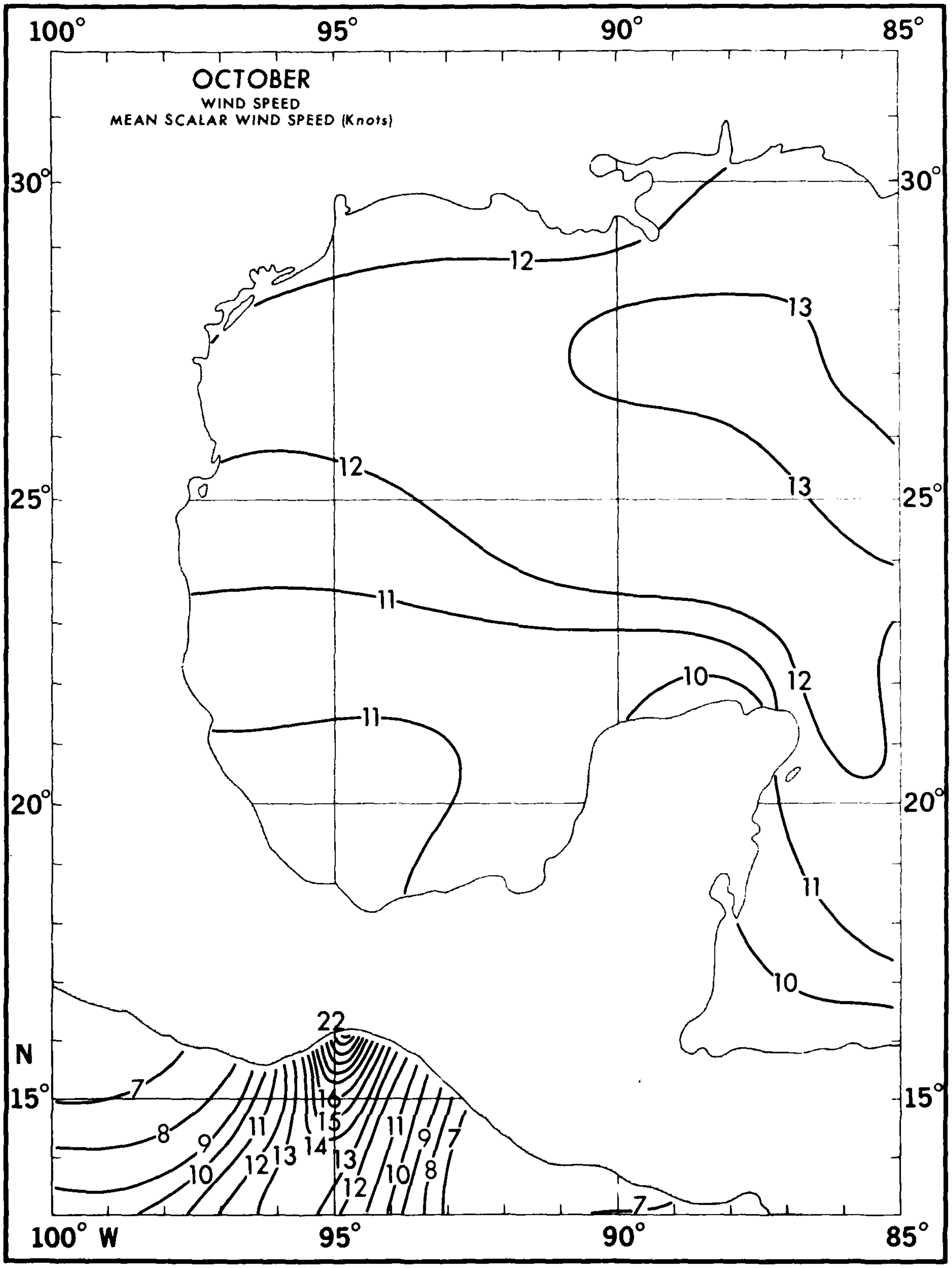

OCTOBER
VISIBILITY (NAUTICAL MILES)
100°
95°
90°
85°
100° W
20°
15°
N

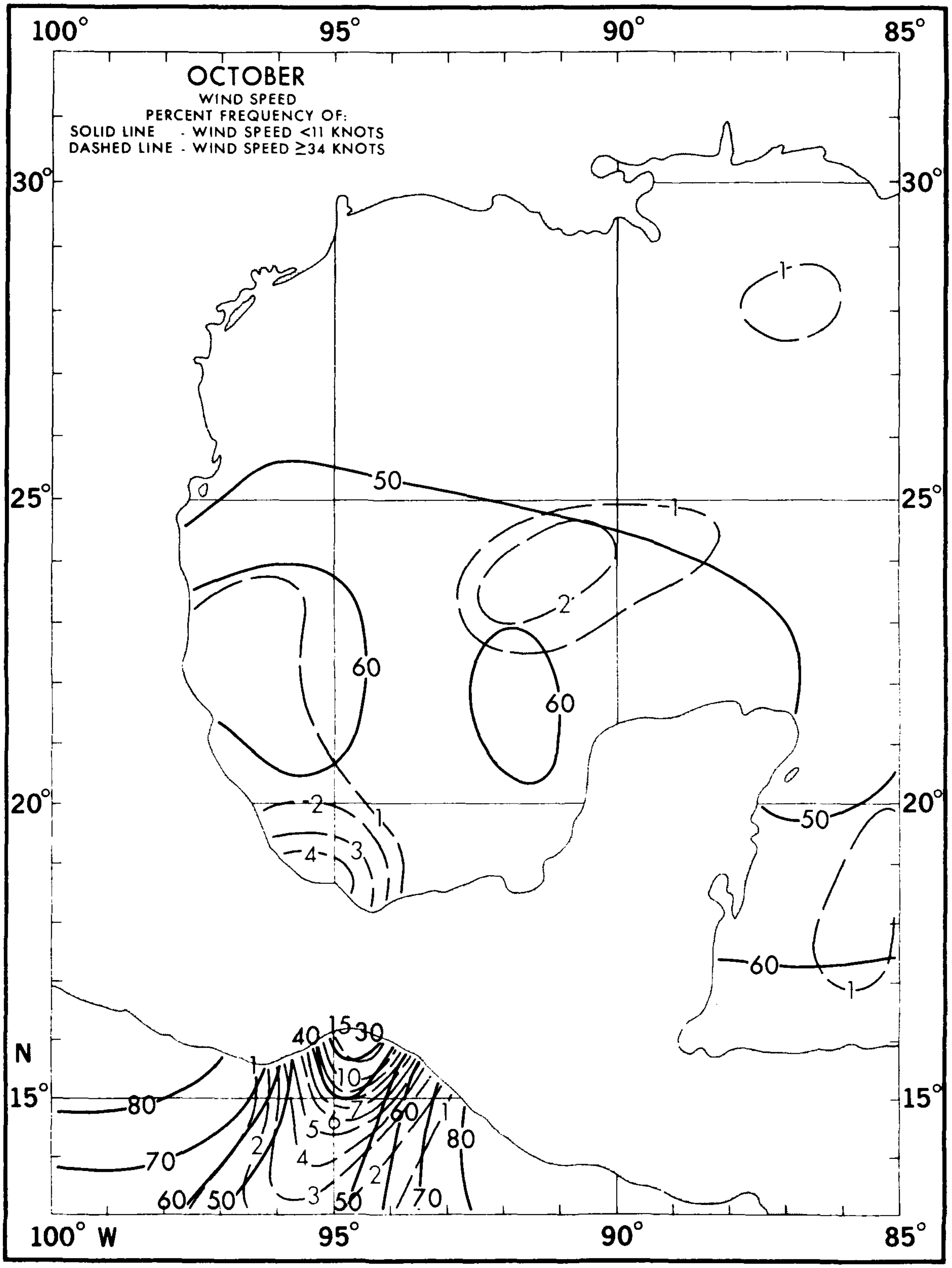

OCTOBER
CEILING-VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES
DASHED LINE - CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
40
30
10
15
<30

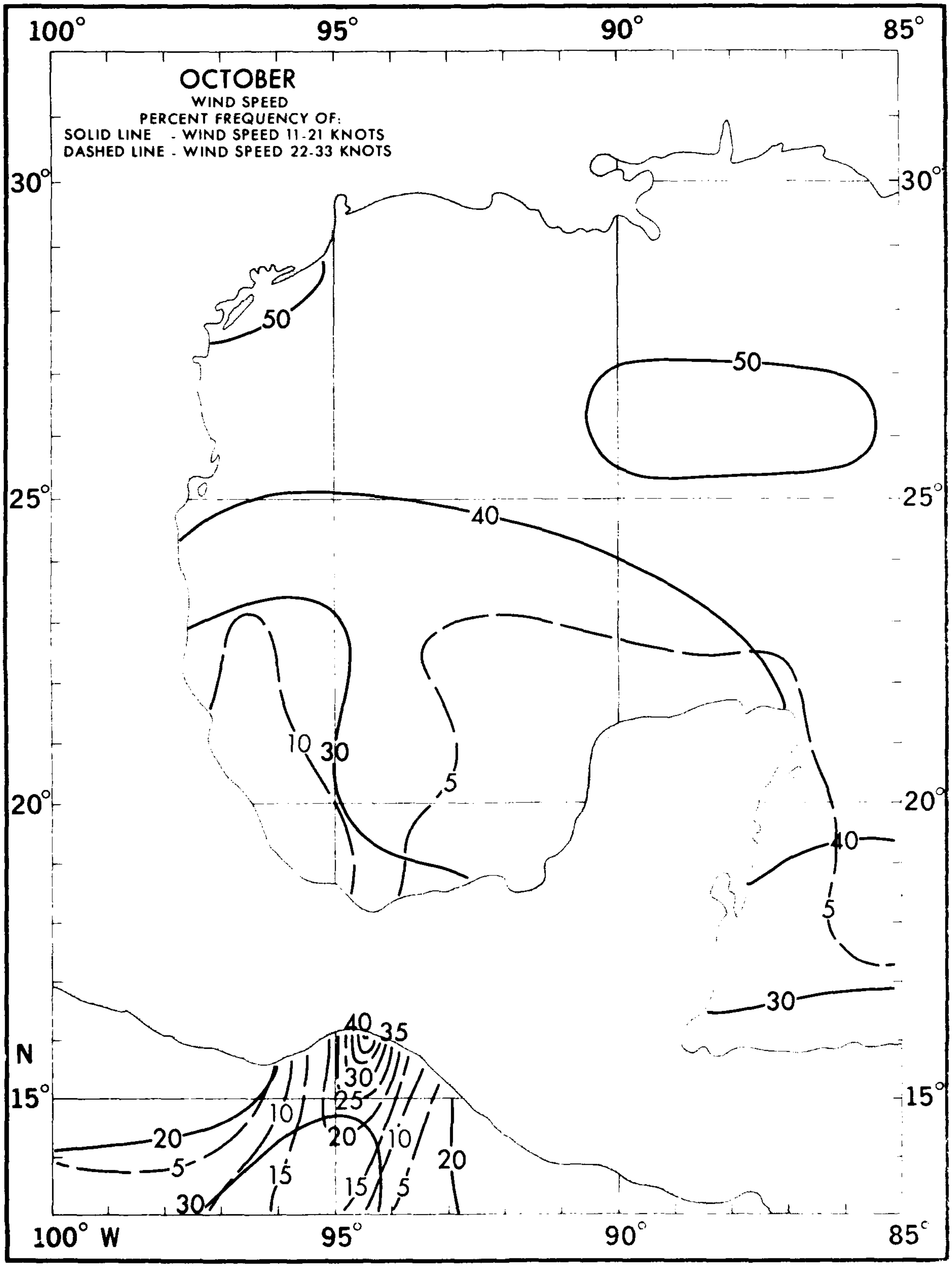


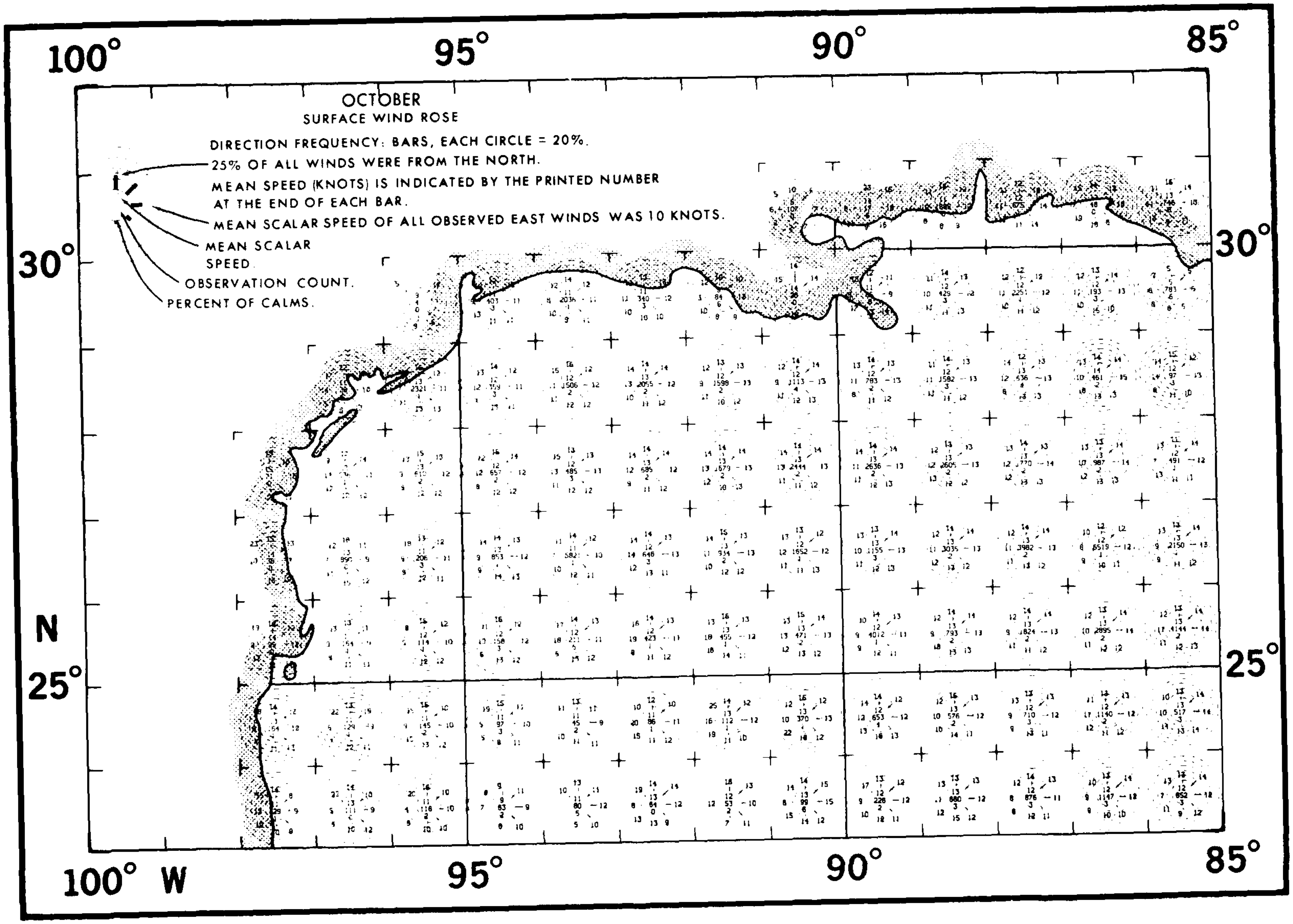
OCTOBER
CEILING-VISIBILITY (LOW RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <300 FEET AND/OR VISIBILITY <1 N. MILE
DASHED LINE - CEILING <600 FEET AND/OR VISIBILITY <2 N. MILES
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W

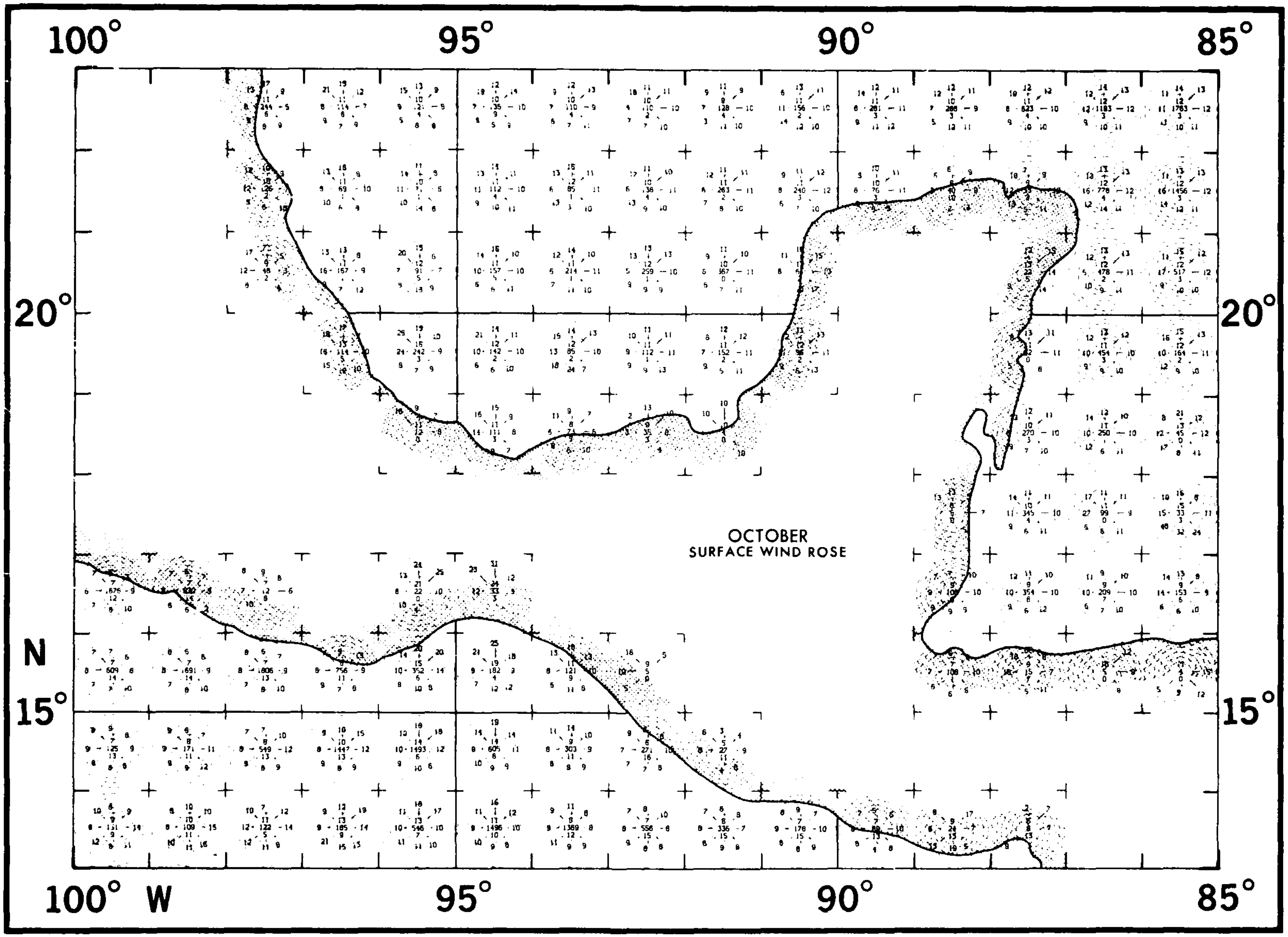

OCTOBER
WIND-VISIBILITY-CLOUDINESS
SOLID LINE - PERCENT FREQUENCY OF OPTIMUM CONDITIONS: LCC ≥5000 FT., (OR NO LCC), VSBY. ≥5 N. MI. AND WIND 11-21 KTS.
DASHED LINE - PERCENT FREQUENCY OF POOR CONDITIONS. ANY ONE OF THE FOLLOWING CONSTITUTES POOR CONDITIONS: LCC <300 FT., VSBY. <1 N. MI., WIND <6 OR ≥34 KTS.
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
15
35
30
25
20
45
40
10
50

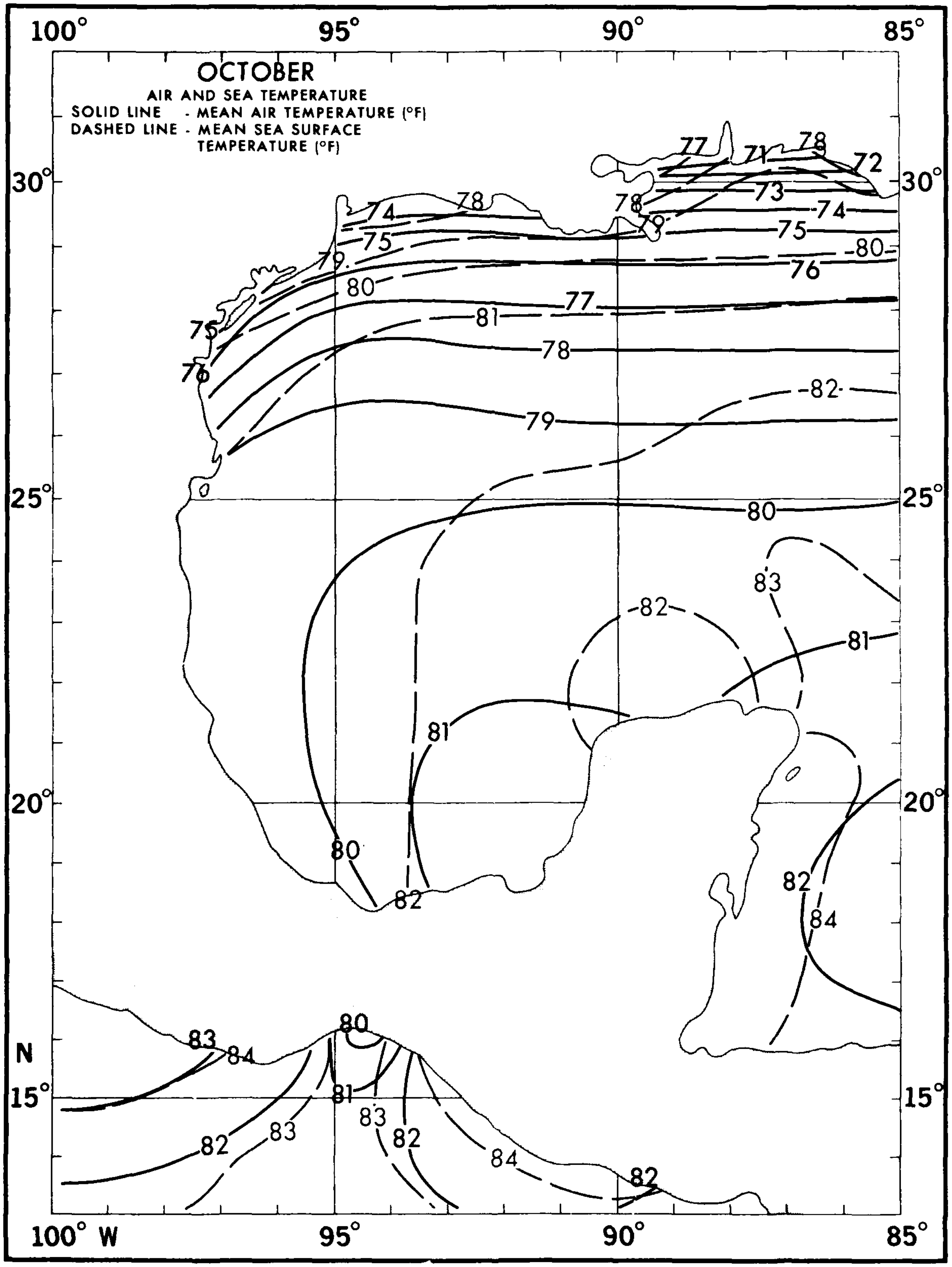

OCTOBER
WIND SPEED
MEAN SCALAR WIND SPEED (Knots)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
12
13
12
13
11
12
10
11
11
10
22
7
8
9
10
11
12
13
14
15
16
13
12
11
10
9
8
7
7


OCTOBER
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED <11 KNOTS
DASHED LINE - WIND SPEED ≥34 KNOTS
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
50
60
60
50
60
80
70
1
2
3
4

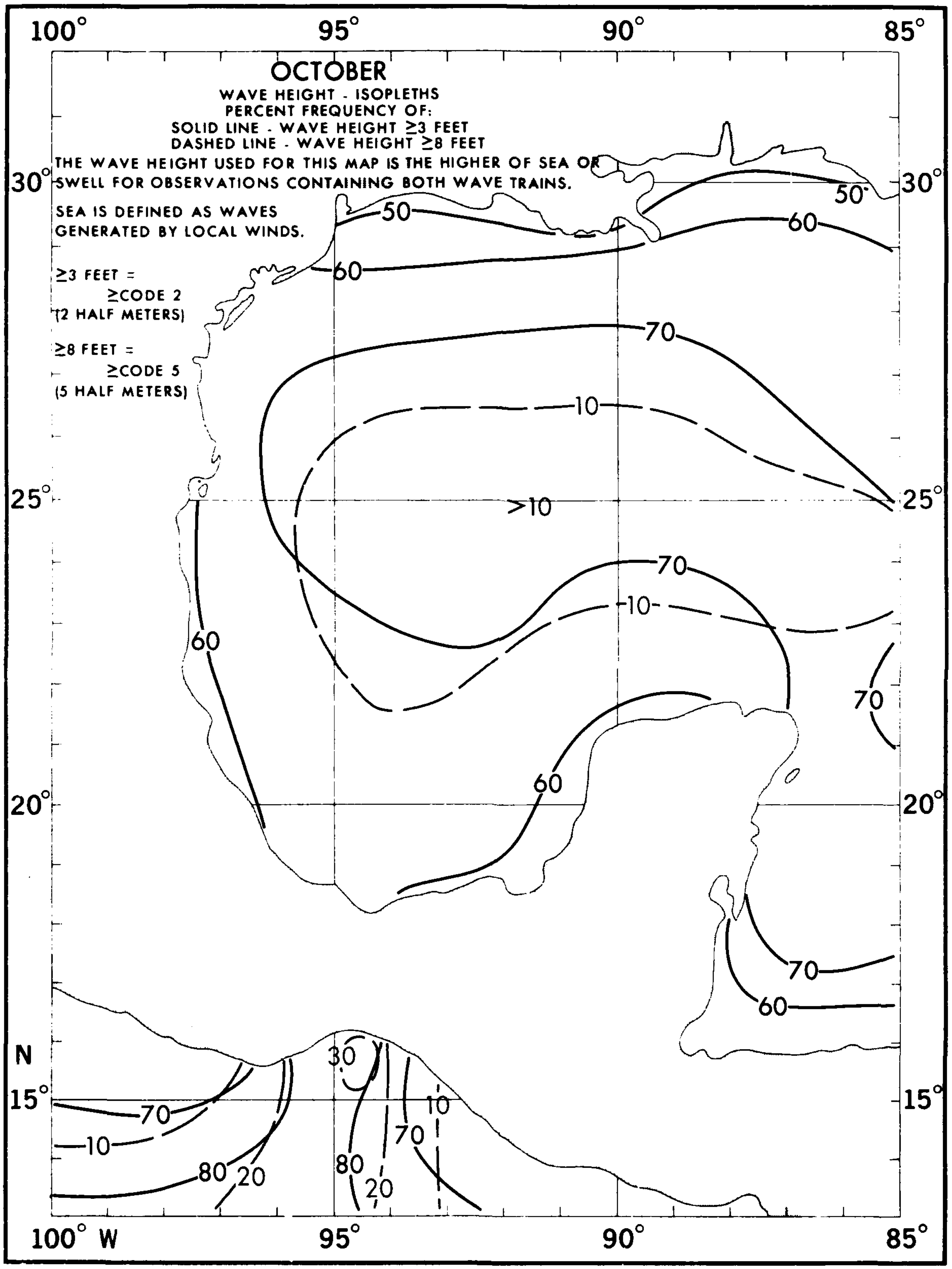

OCTOBER
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED 11-21 KNOTS
DASHED LINE - WIND SPEED 22-33 KNOTS
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
50
40
30
10
5
35
25
20
15


OCTOBER
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM THE NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
100°
95°
90°
85°
30°
25°
N
100° W

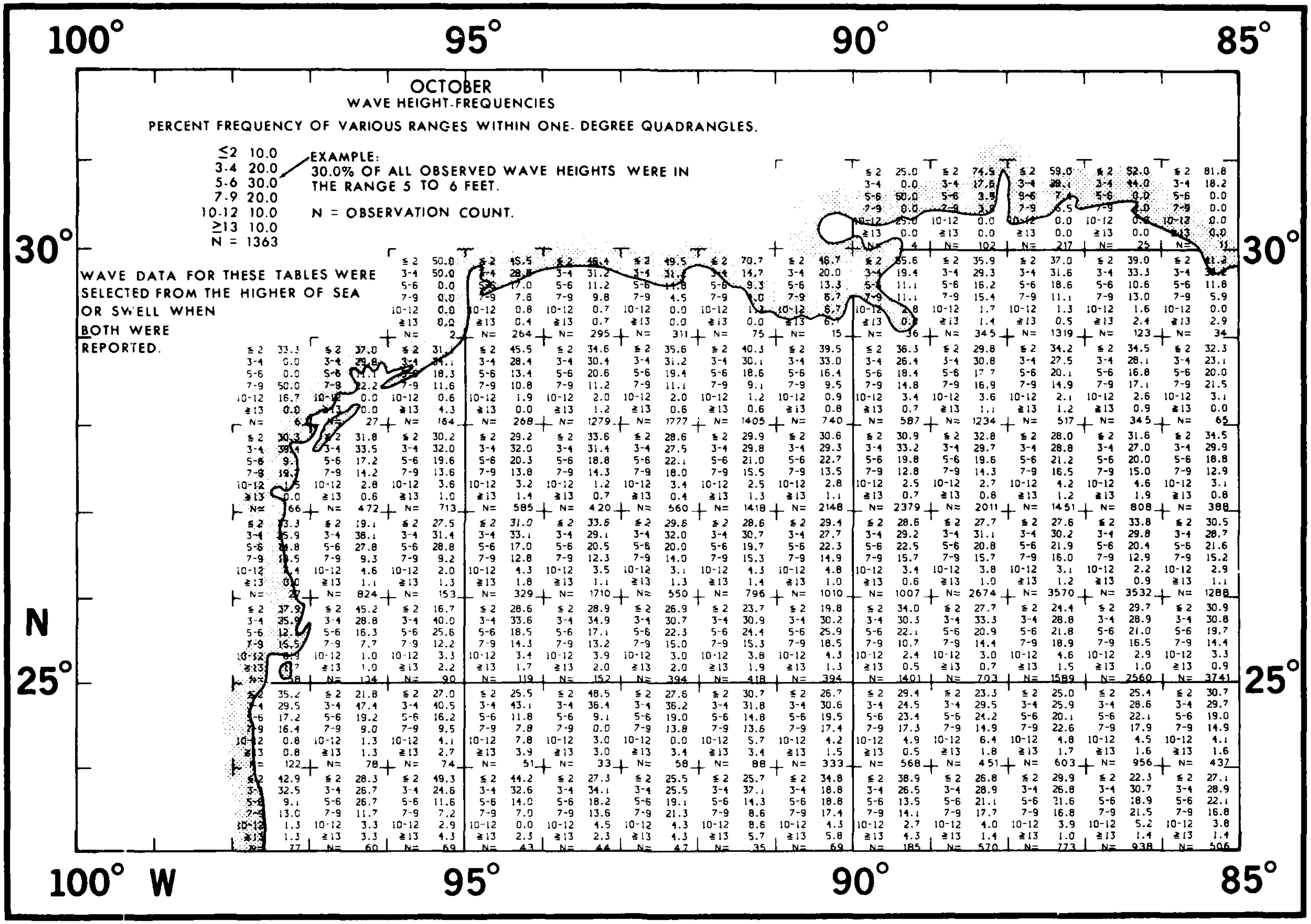

100°
95°
90°
85°
20°
20°
OCTOBER
SURFACE WIND ROSE
N
15°
15°
100° W
95°
90°
85°



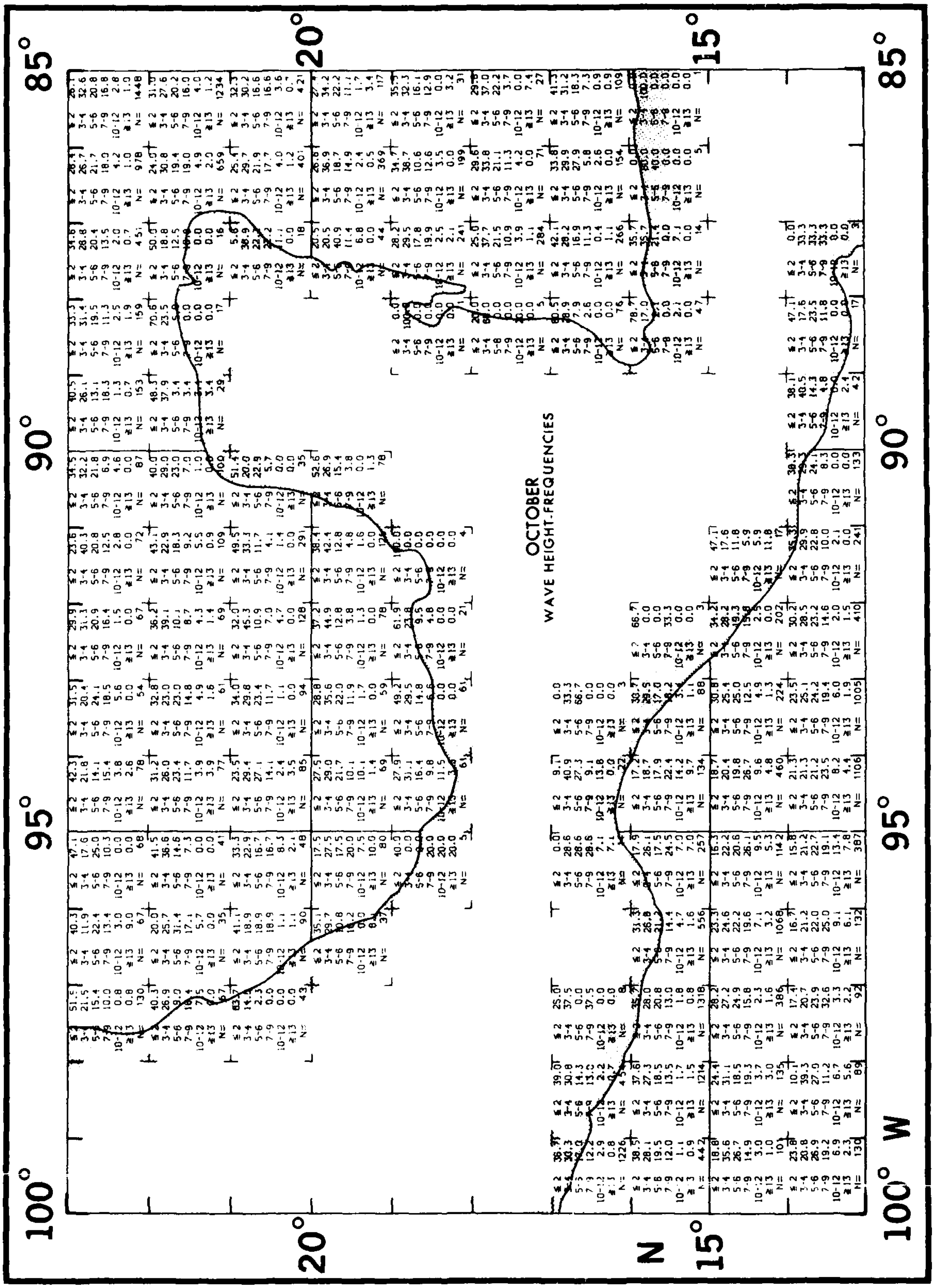
OCTOBER
AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W

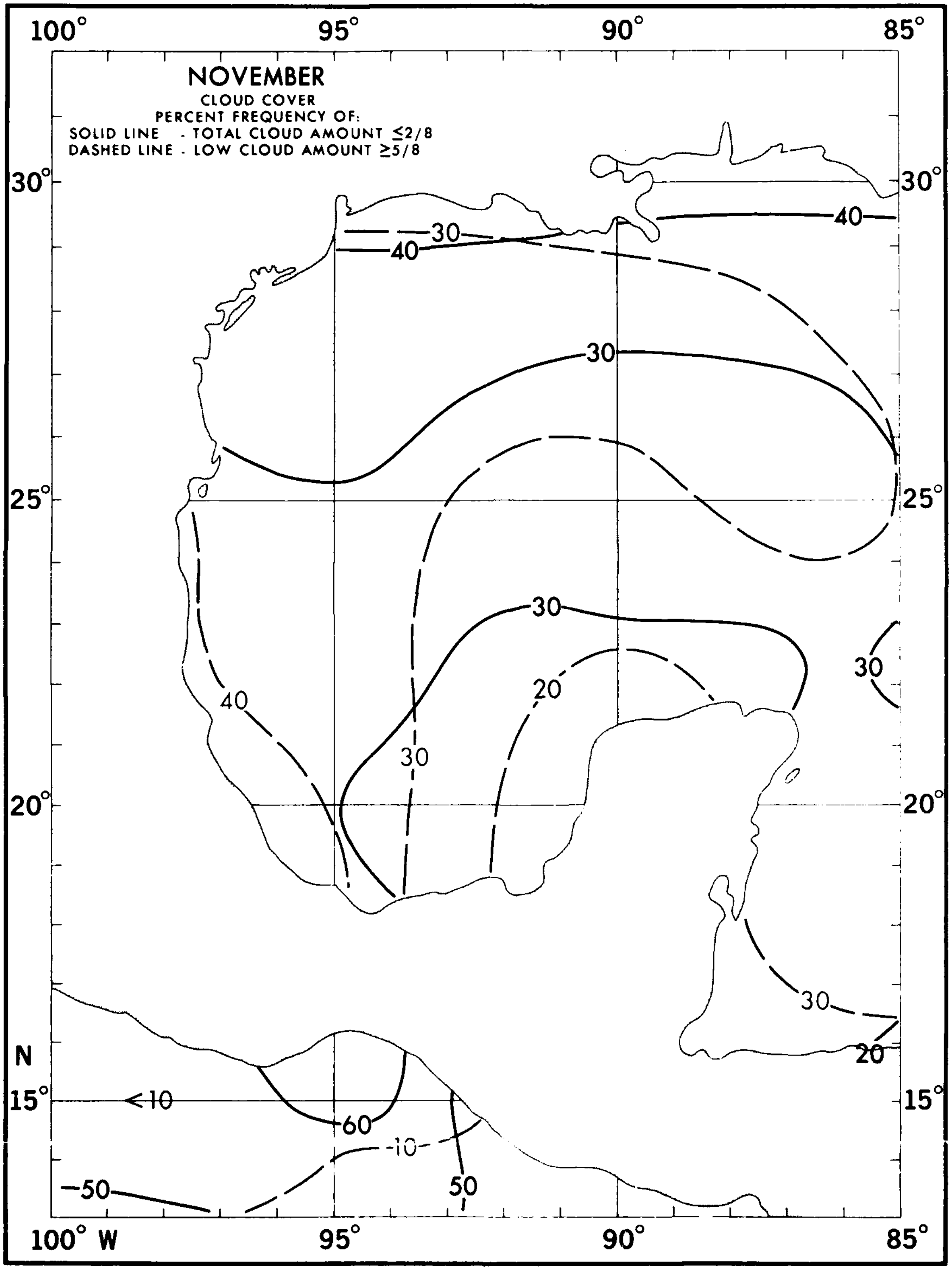


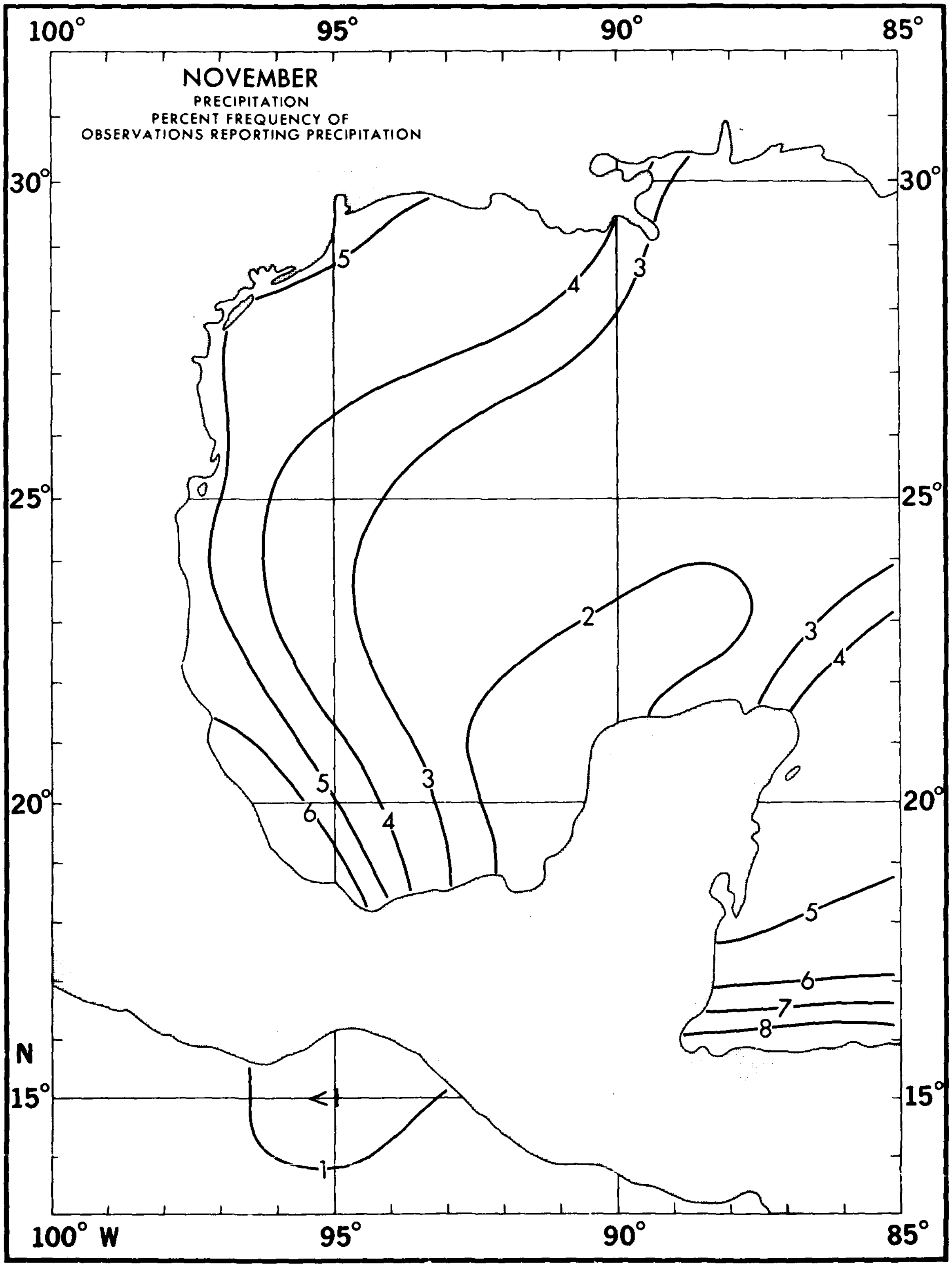
OCTOBER
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
SOLID LINE - WAVE HEIGHT ≥3 FEET
DASHED LINE - WAVE HEIGHT ≥8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS.
SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
50
60
70
10
>10
80
20
30

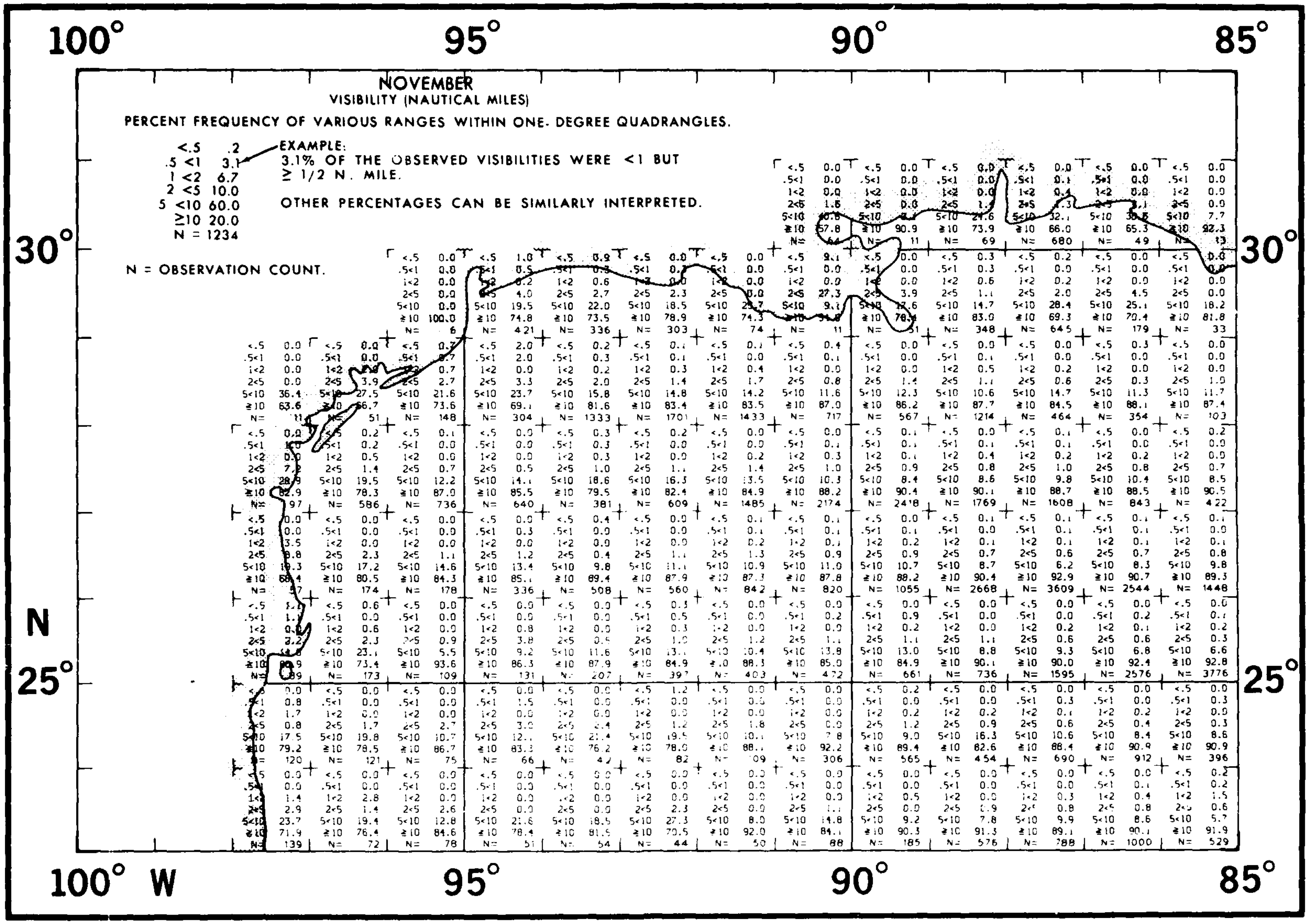


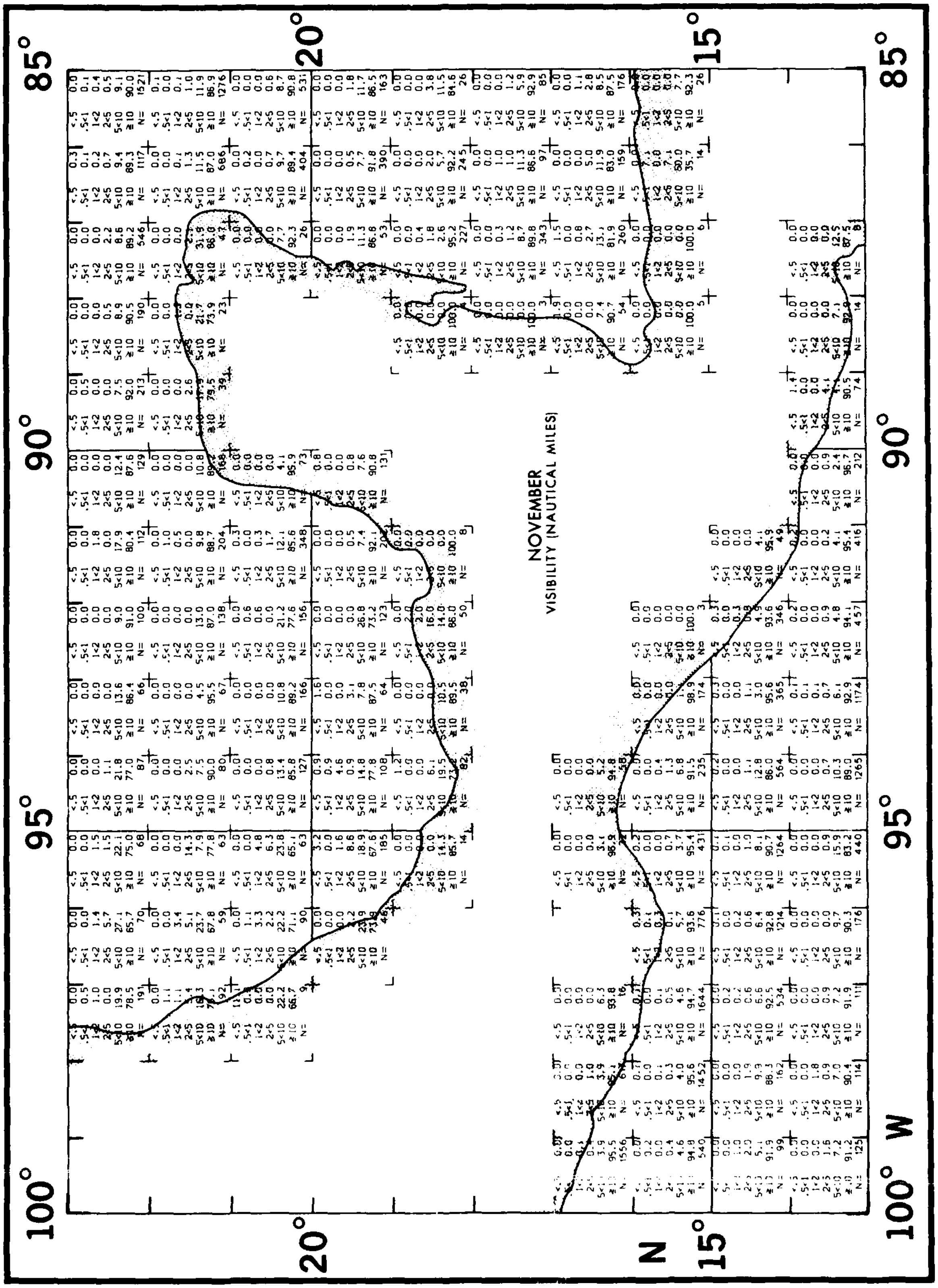
OCTOBER
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
EXAMPLE:
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
100°
95°
90°
85°
30°
25°
N
100° W

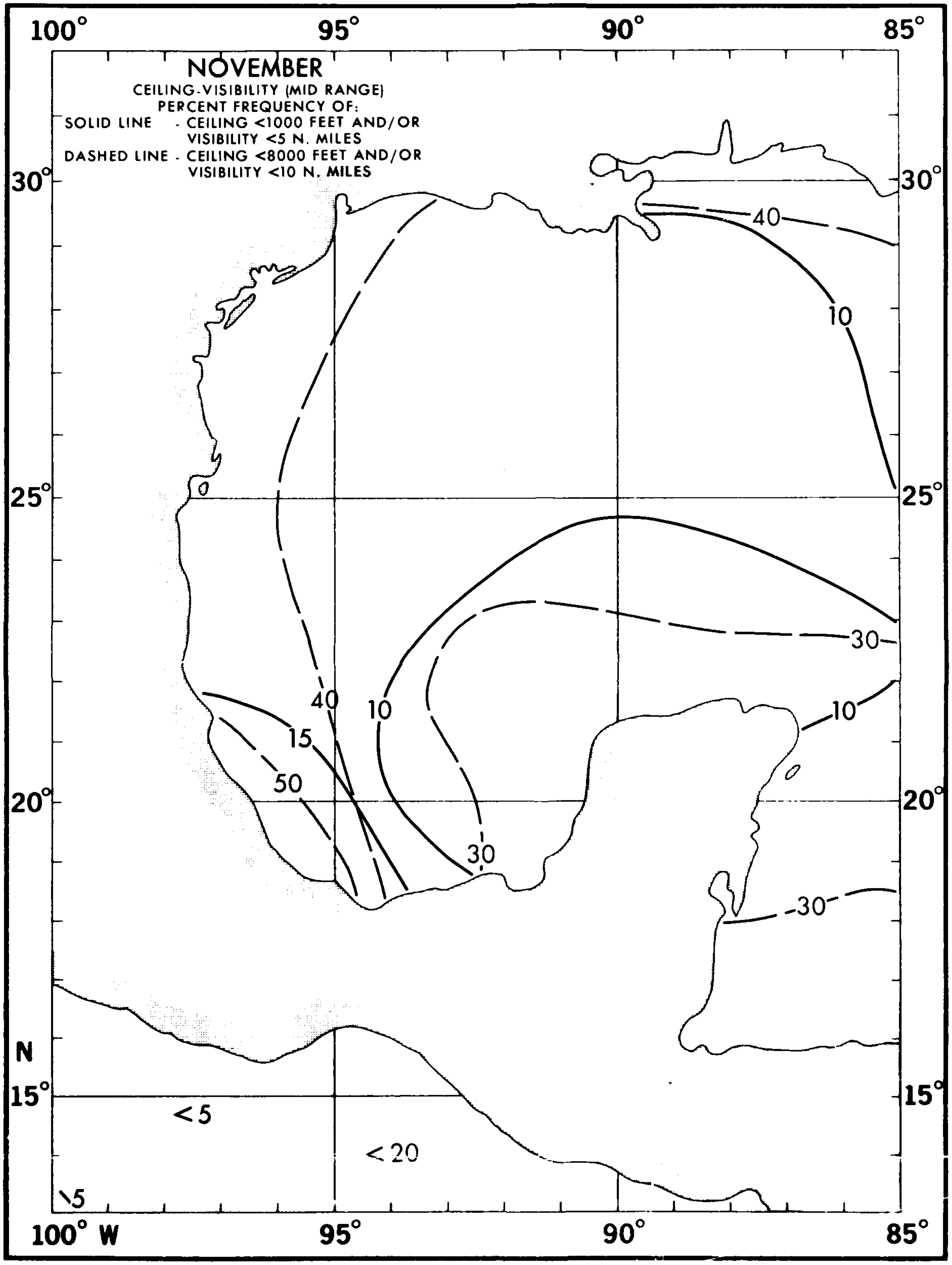

OCTOBER
WAVE HEIGHT FREQUENCIES
85°
90°
95°
100°
100° W
20°
15°
N


NOVEMBER
CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE - TOTAL CLOUD AMOUNT ≤2/8
DASHED LINE - LOW CLOUD AMOUNT ≥5/8
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
30
40
20
60
<10
10
50

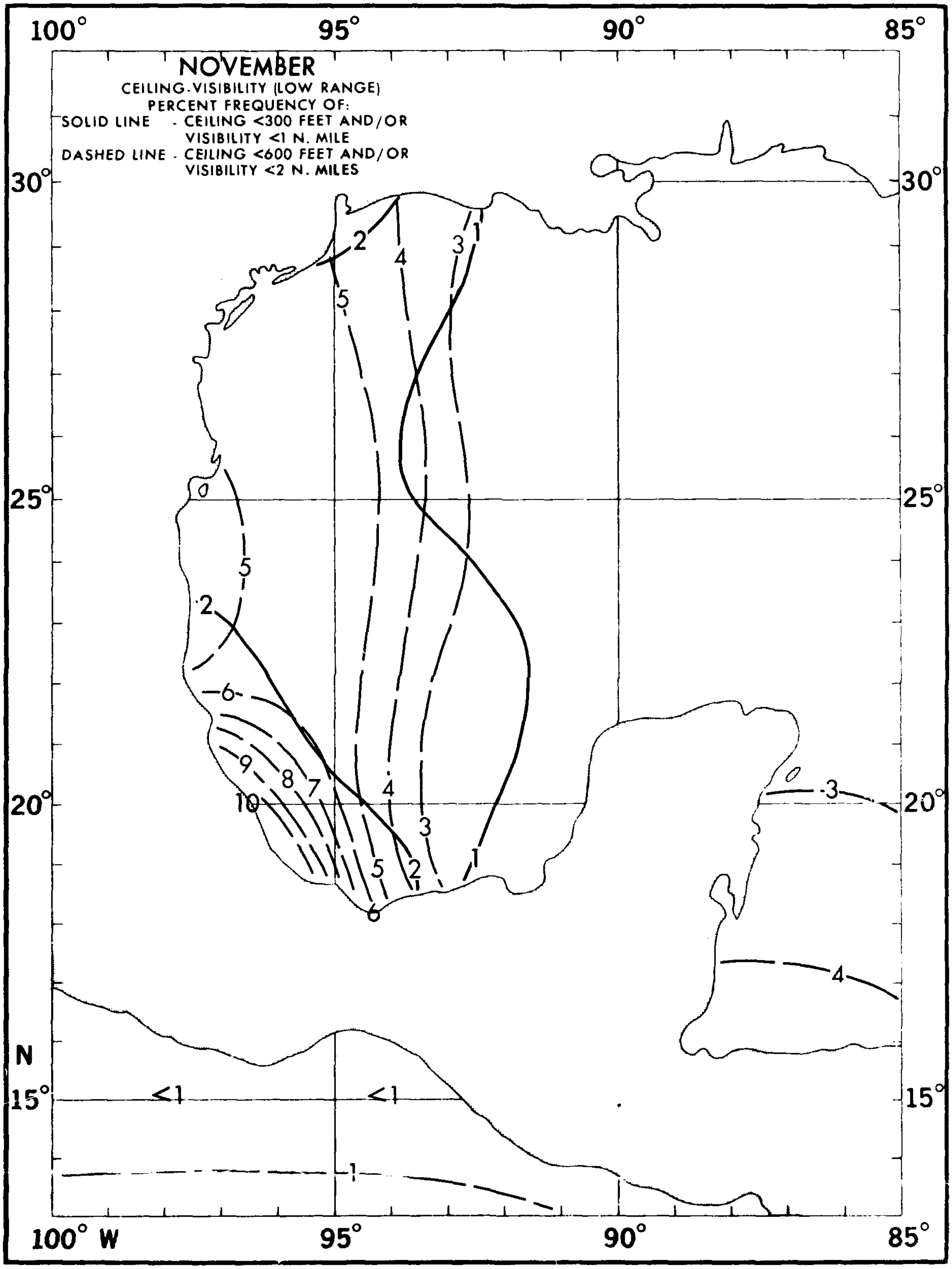

NOVEMBER
PRECIPITATION
PERCENT FREQUENCY OF
OBSERVATIONS REPORTING PRECIPITATION
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
5
4
3
2
6
7
8
<1
1

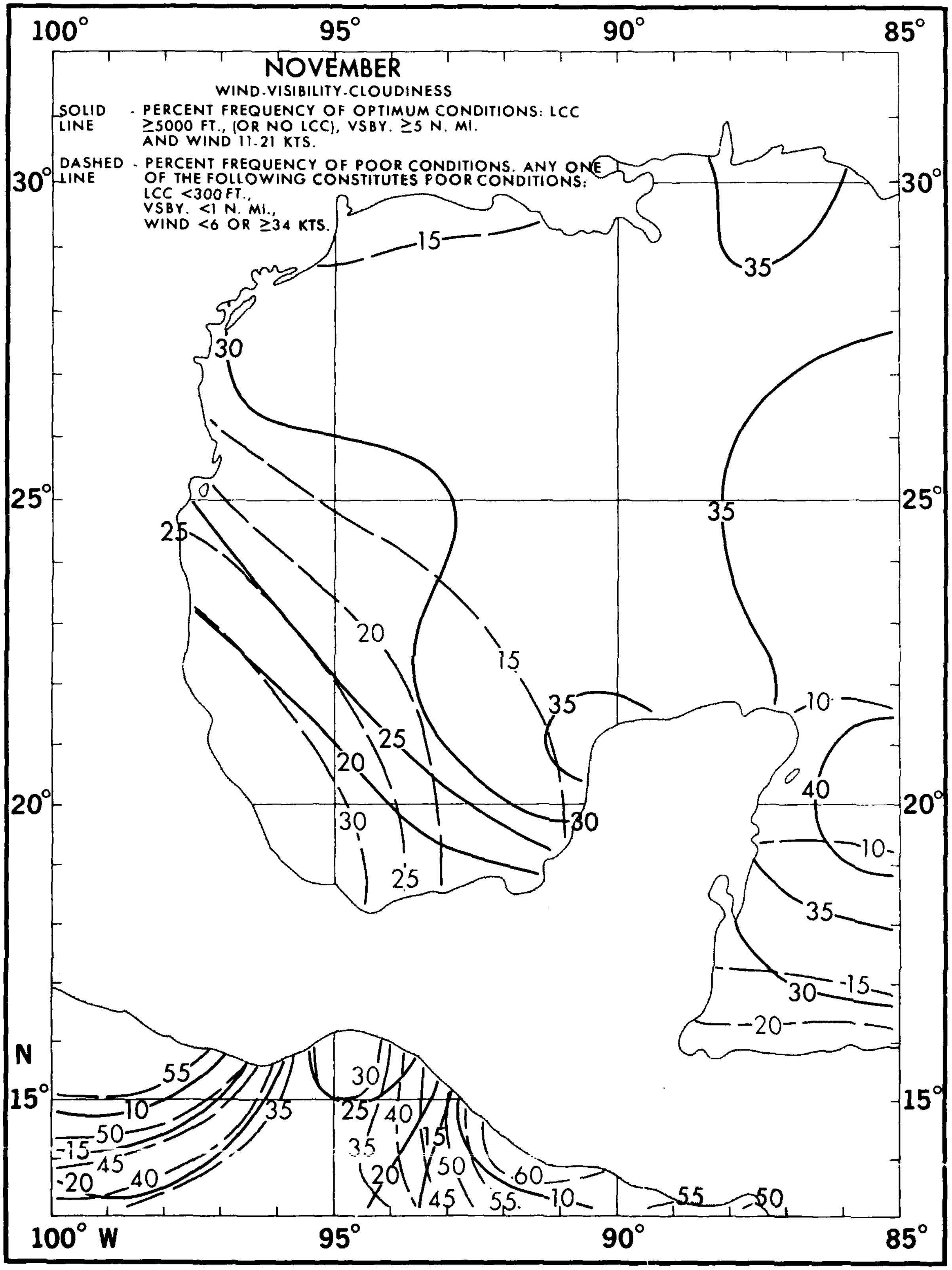

NOVEMBER
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE- DEGREE QUADRANGLES.
<.5 .2
.5 <1 3.1
1 <2 6.7
2 <5 10.0
5 <10 60.0
≥10 20.0
N = 1234
EXAMPLE:
3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥ 1/2 N. MILE.
OTHER PERCENTAGES CAN BE SIMILARLY INTERPRETED.
N = OBSERVATION COUNT.
100°
95°
90°
85°
30°
25°
N
100° W


NOVEMBER
VISIBILITY (NAUTICAL MILES)
100°
95°
90°
85°
100° W
20°
15°
N

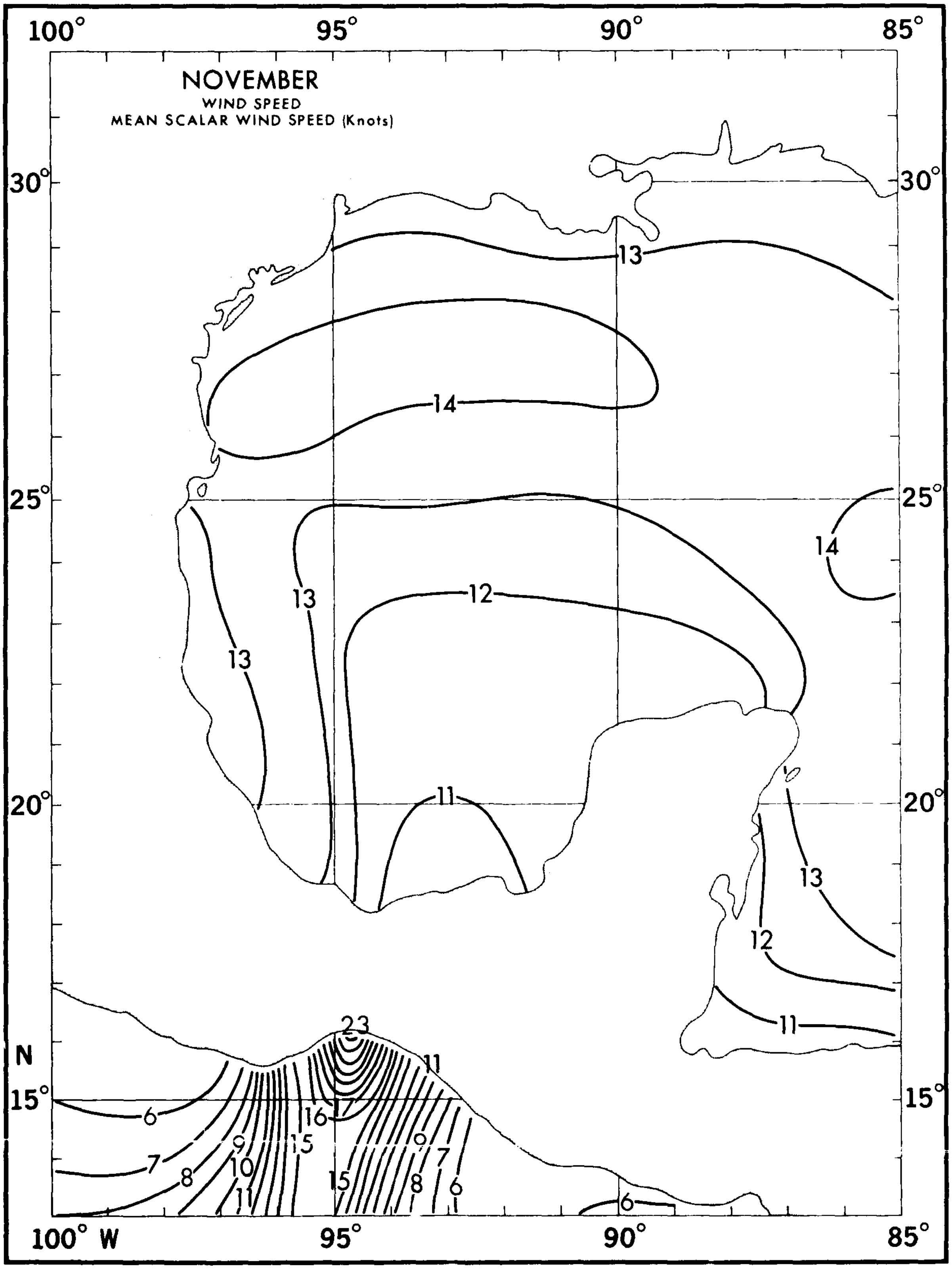


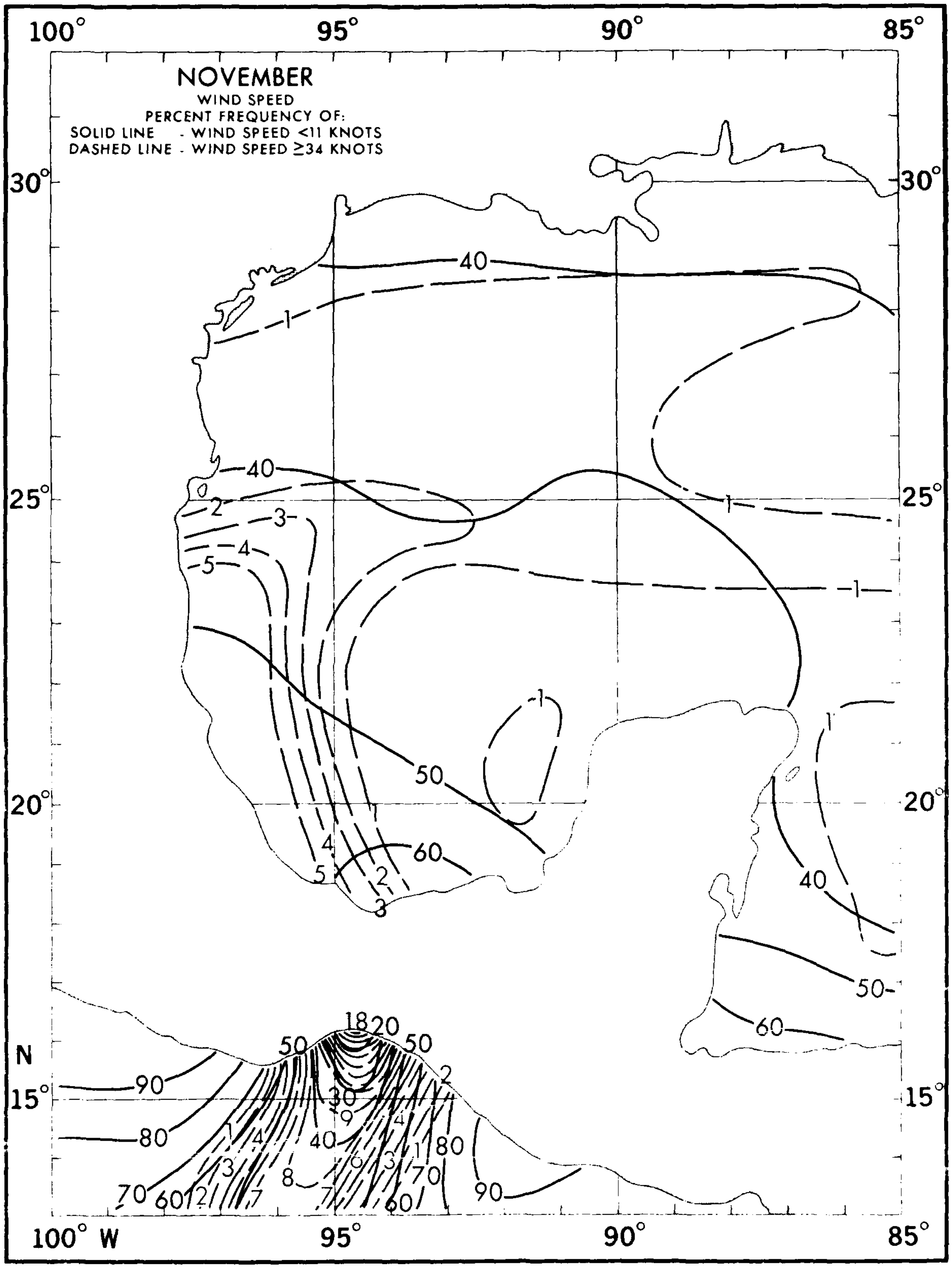
NOVEMBER
CEILING-VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES
DASHED LINE - CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
40
10
30
15
50
<5
<20
5


NOVEMBER
CEILING-VISIBILITY (LOW RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <300 FEET AND/OR VISIBILITY <1 N. MILE
DASHED LINE - CEILING <600 FEET AND/OR VISIBILITY <2 N. MILES
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
<1
<1
1
2
3
4
5
6
7
8
9
10



NOVEMBER
WIND-VISIBILITY-CLOUDINESS
SOLID LINE - PERCENT FREQUENCY OF OPTIMUM CONDITIONS: LCC ≥5000 FT., (OR NO LCC), VSBY. ≥5 N. MI. AND WIND 11-21 KTS.
DASHED LINE - PERCENT FREQUENCY OF POOR CONDITIONS. ANY ONE OF THE FOLLOWING CONSTITUTES POOR CONDITIONS: LCC <300 FT., VSBY. <1 N. MI., WIND <6 OR ≥34 KTS.
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W


NOVEMBER
WIND SPEED
MEAN SCALAR WIND SPEED (Knots)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
13
14
12
11
23
16
17
15
10
9
8
7
6


NOVEMBER
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED <11 KNOTS
DASHED LINE - WIND SPEED ≥34 KNOTS
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W

AD-A175 250 US NAVY CLIMATIC STUDY OF THE CARIBBEAN SEA AND GULF OF MEXICO VOLUME 4 G..(U) NAVAL AIR SYSTEMS COMMAND WASHINGTON DC SEP 86 NAVAIR-50-1C-546 3/3

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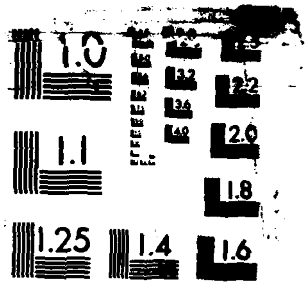
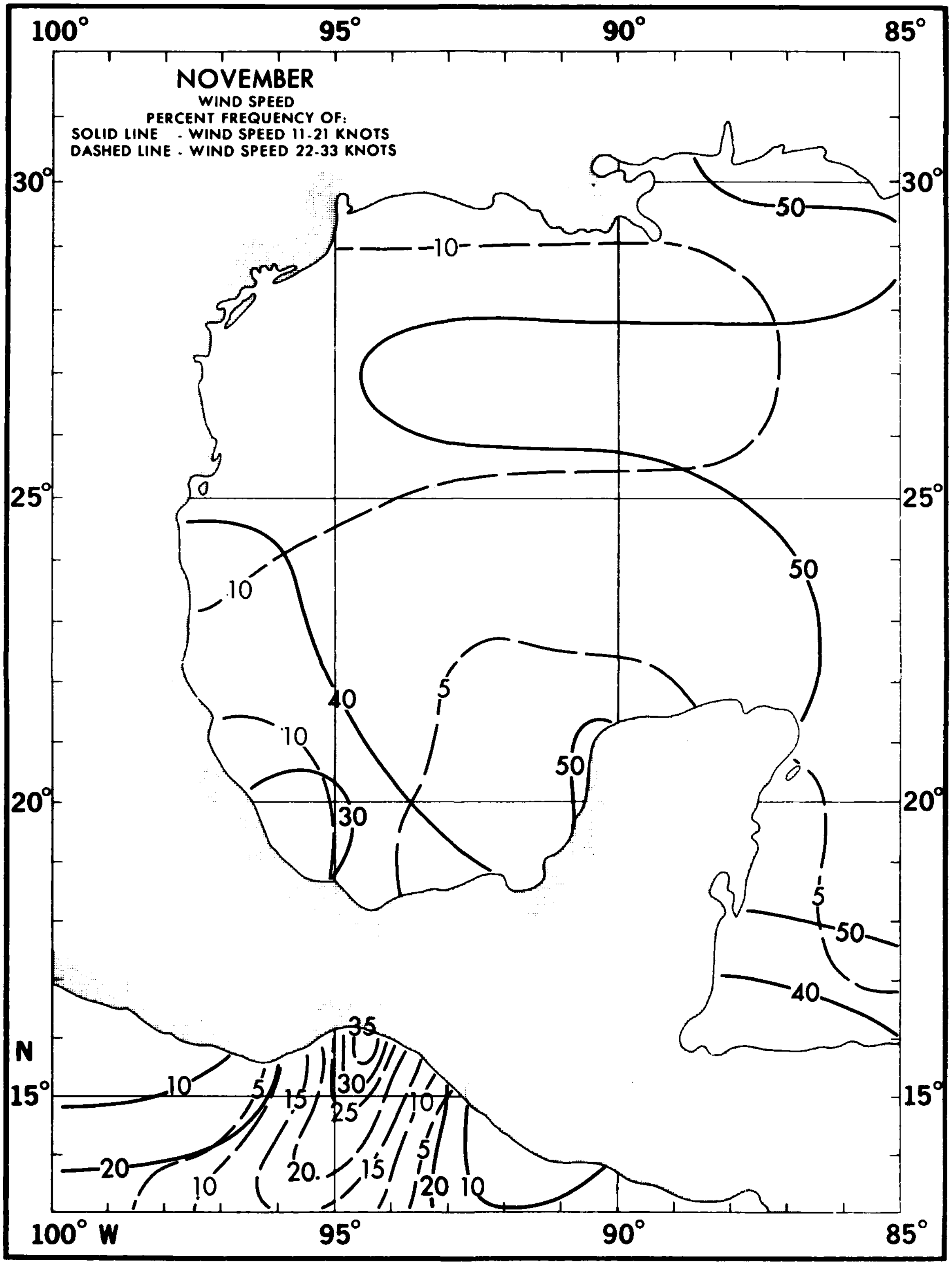
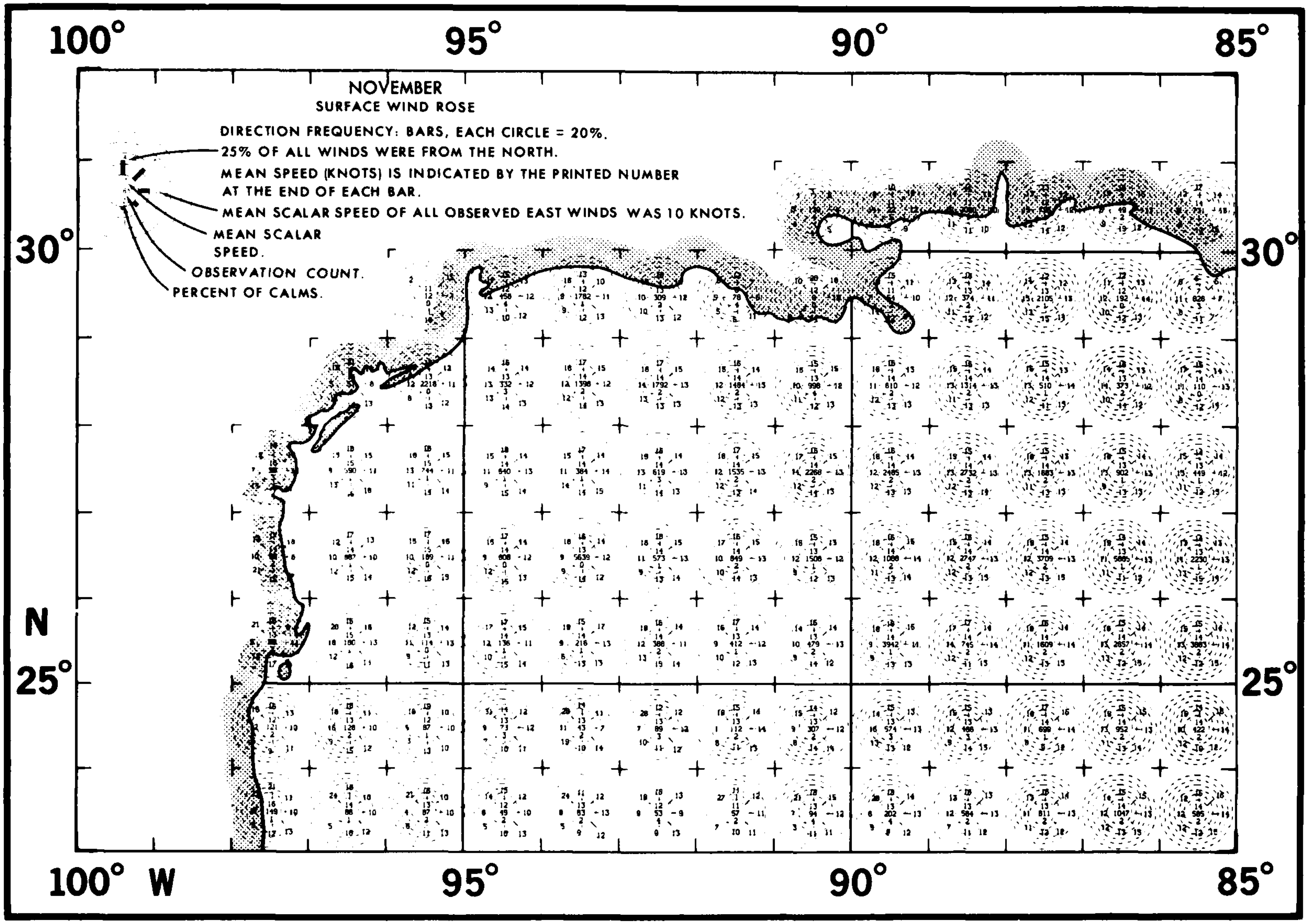
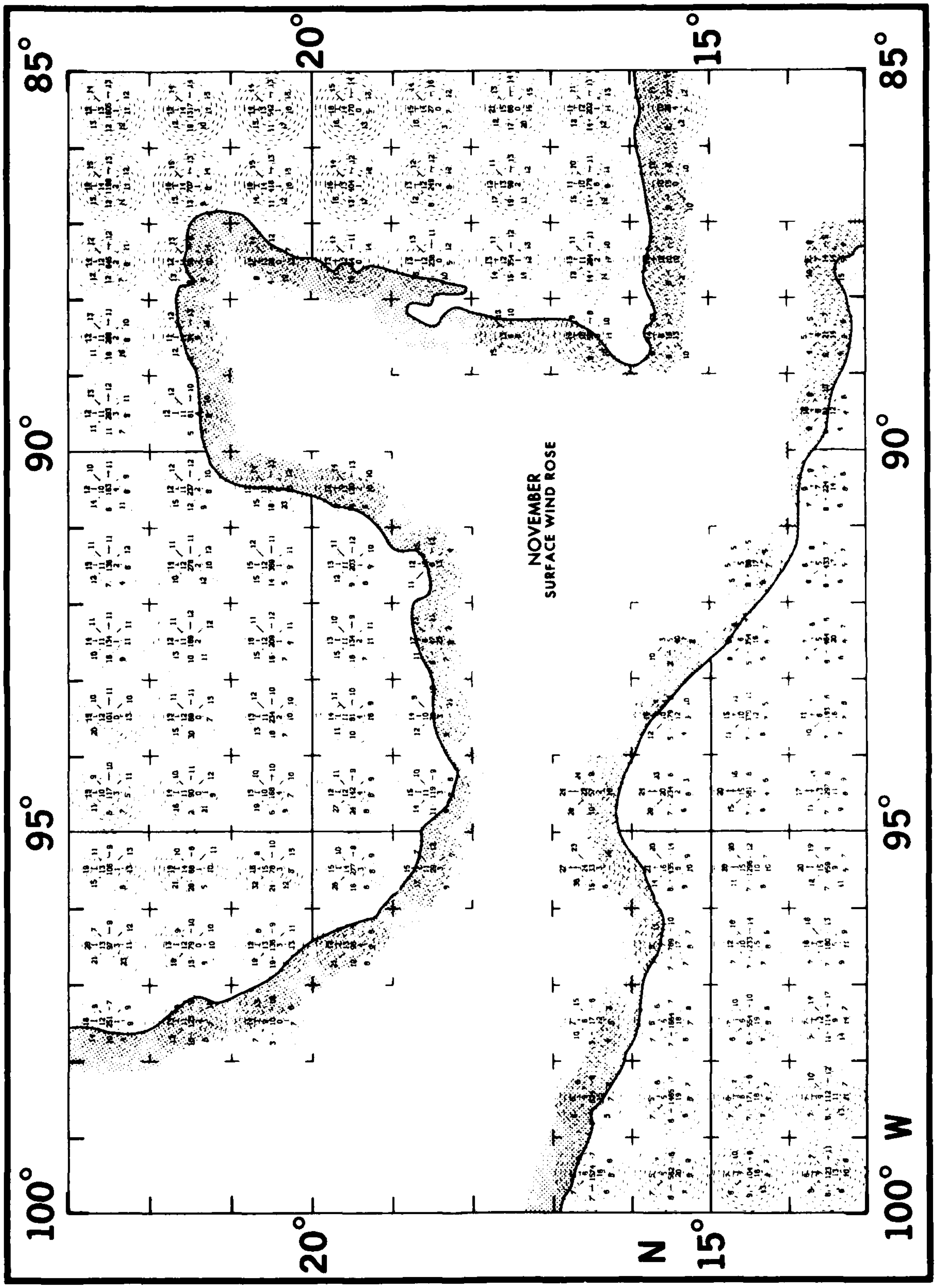
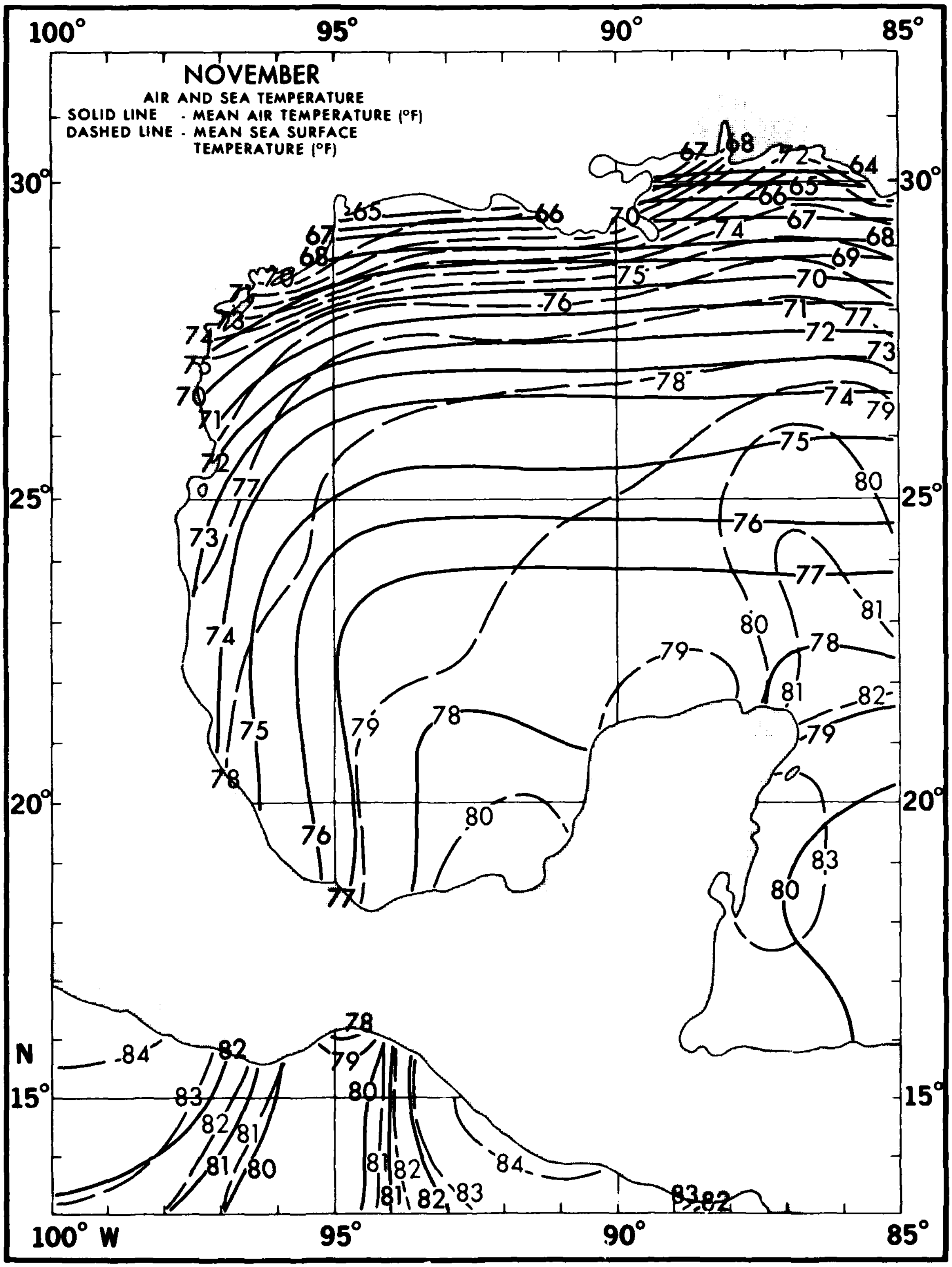


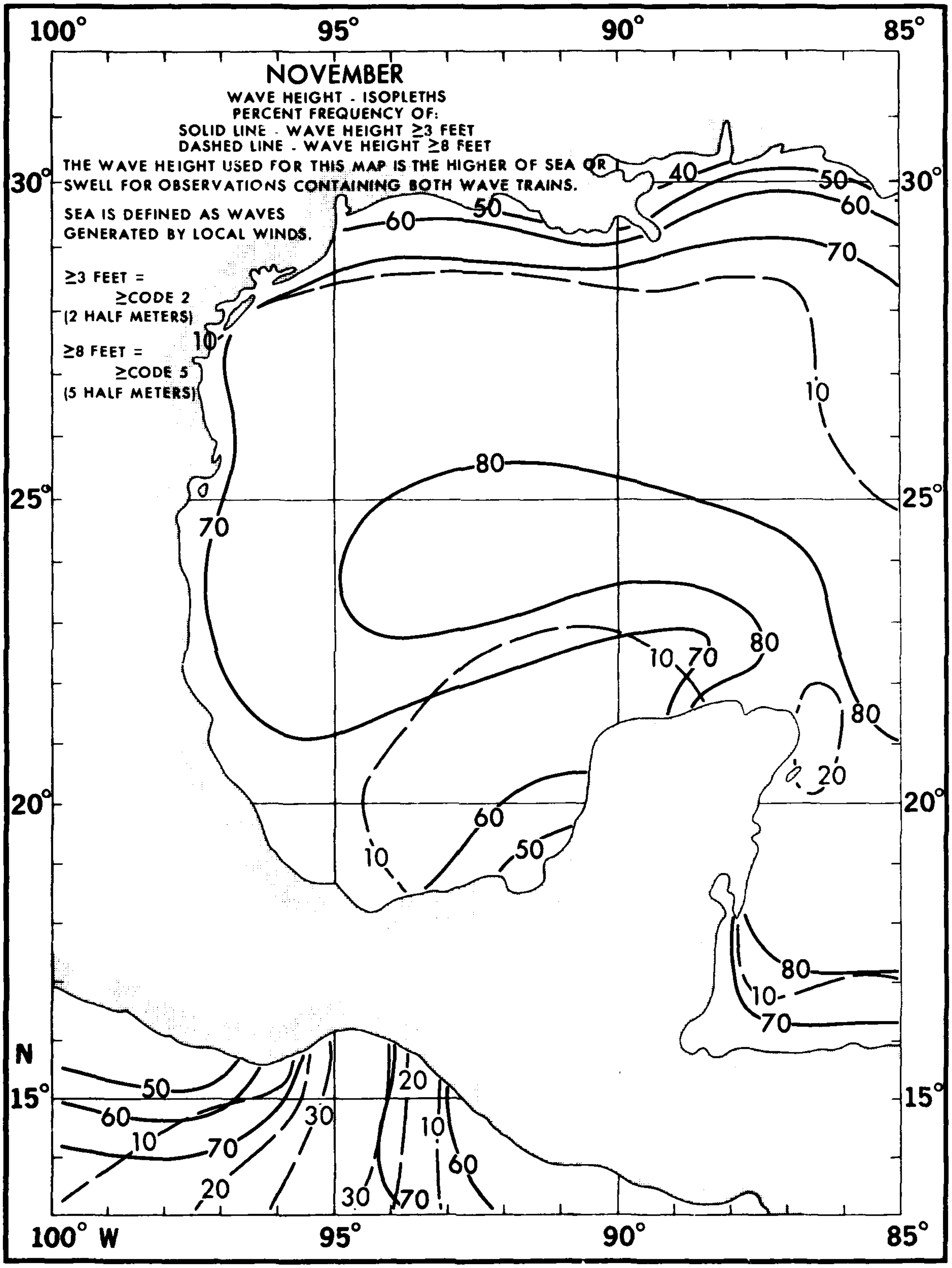
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

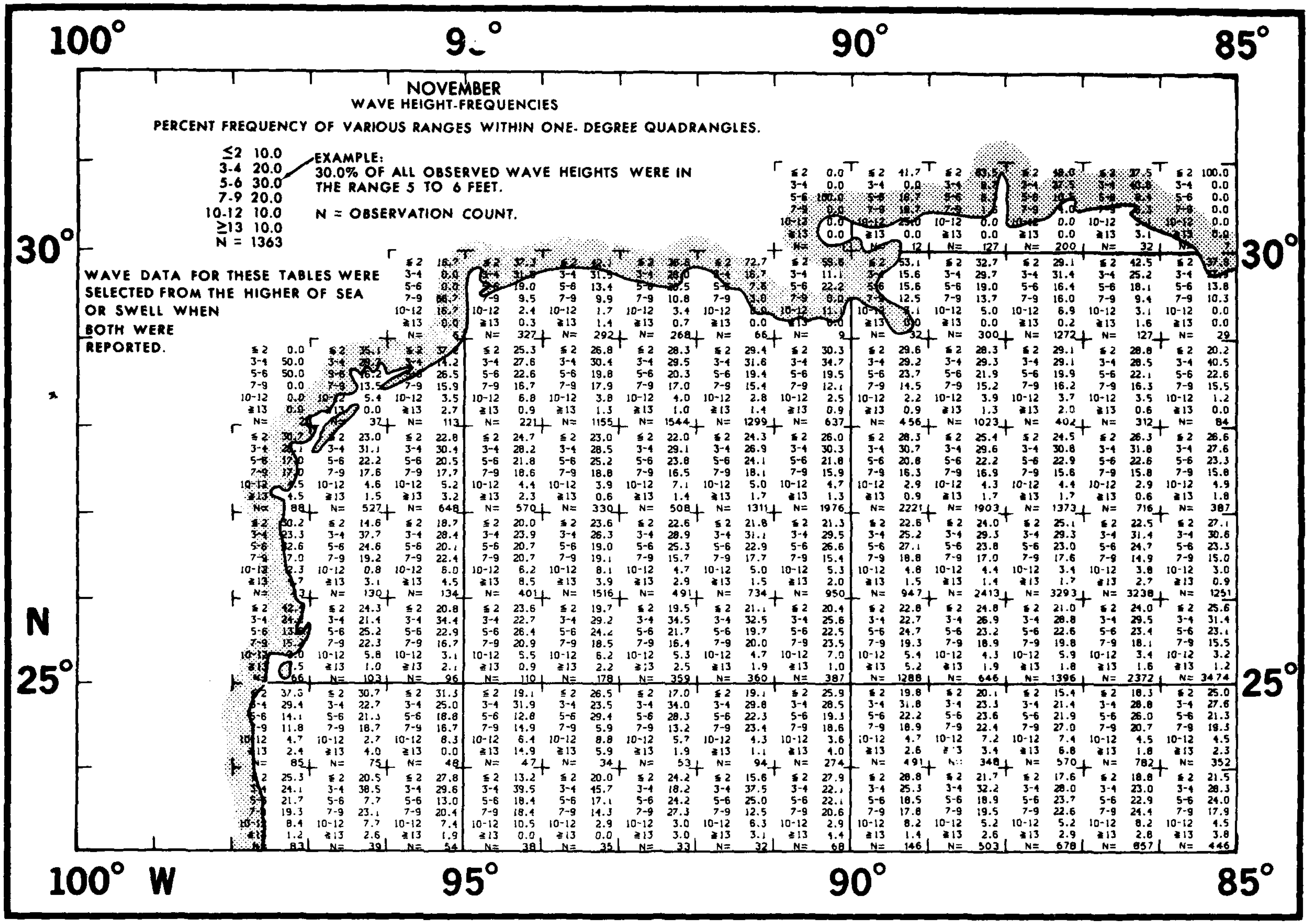

NOVEMBER
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED 11-21 KNOTS
DASHED LINE - WIND SPEED 22-33 KNOTS
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
10
50
40
30
5
35
25
20
15

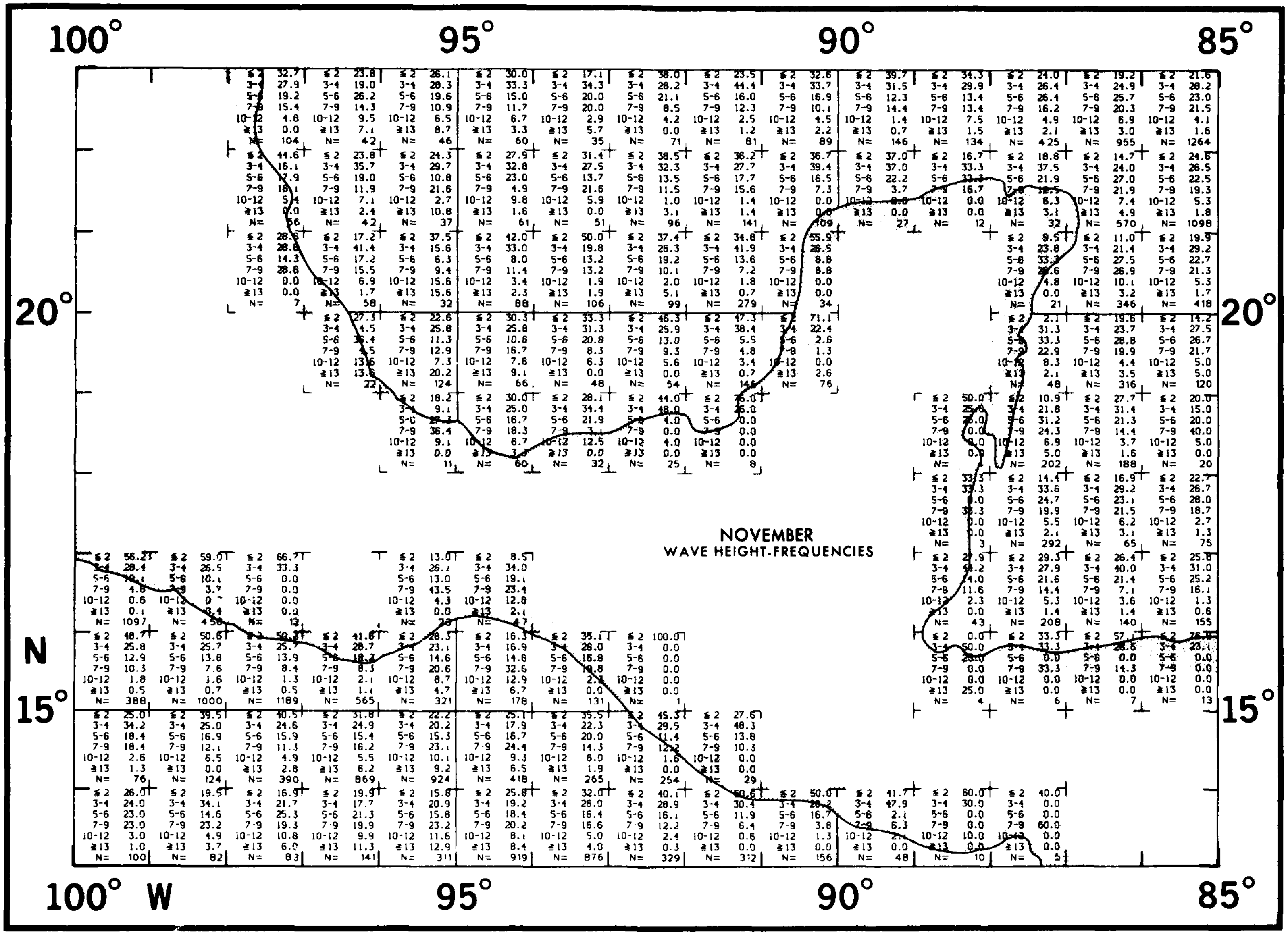

NOVEMBER
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM THE NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
100°
95°
90°
85°
30°
25°
N
100° W

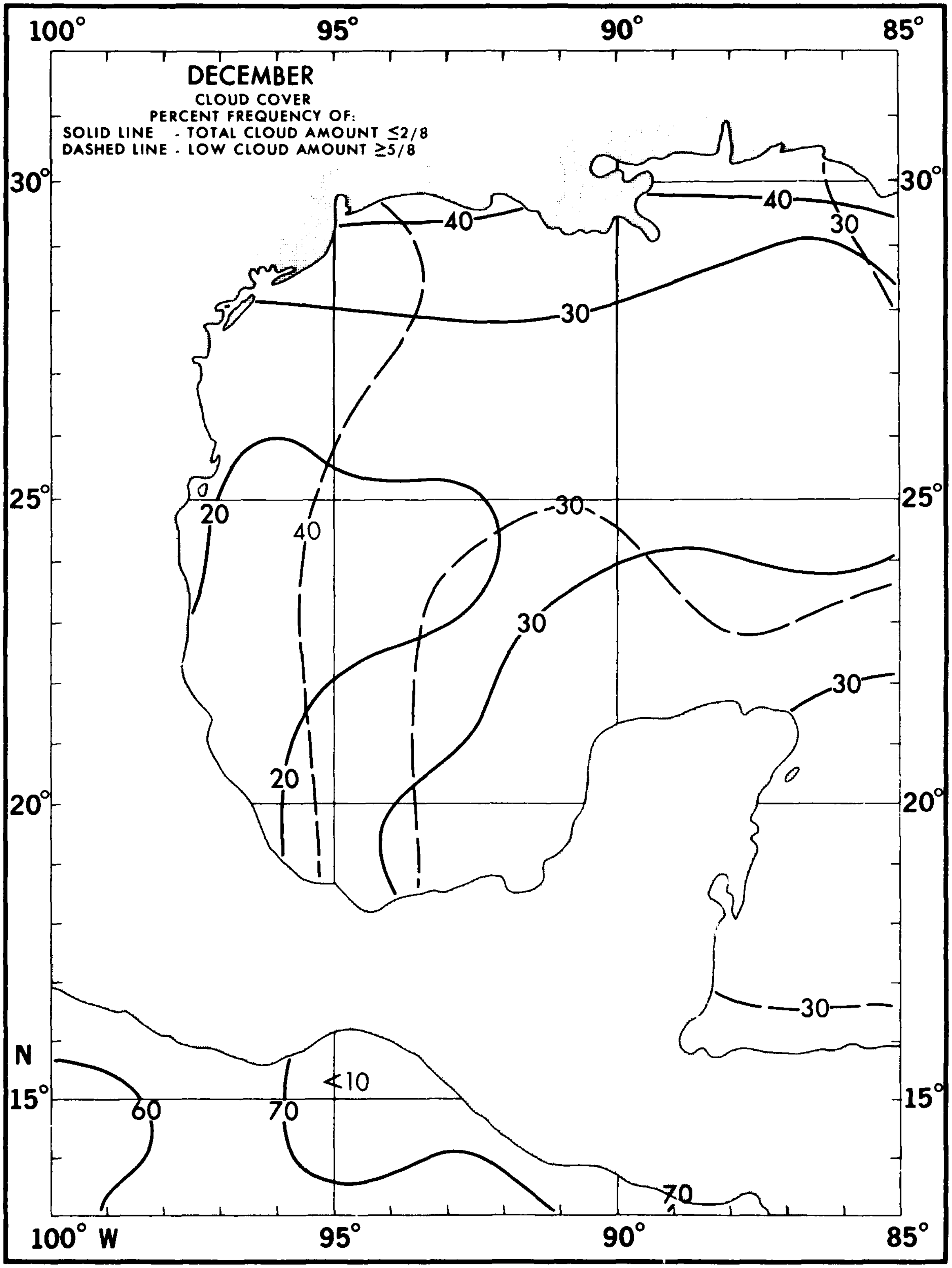

NOVEMBER
SURFACE WIND ROSE
85°
90°
95°
100° W
20°
15°
N

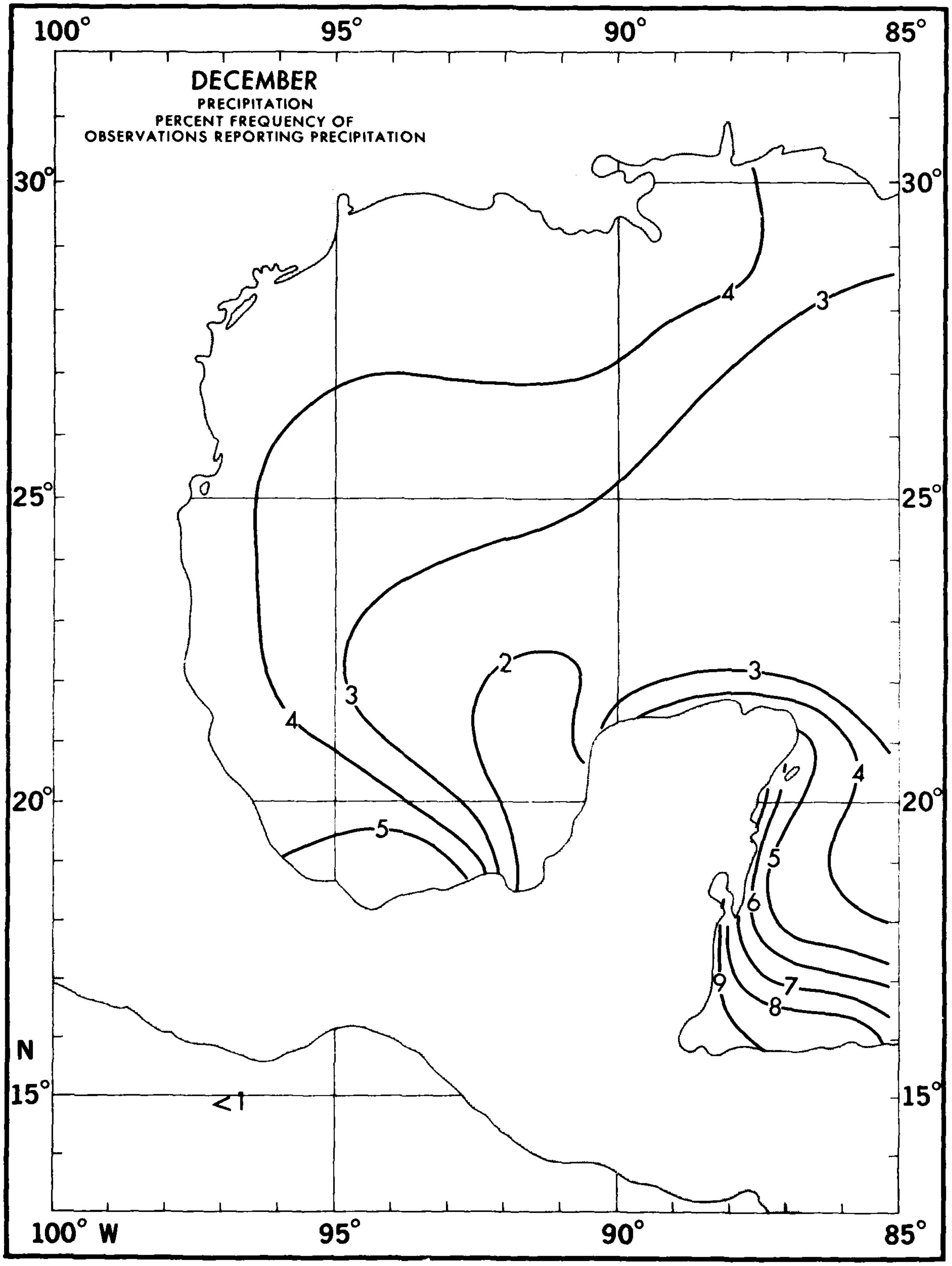

NOVEMBER
AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
100°
95°
90°
85°
30°
25°
20°
N
15°
100° W

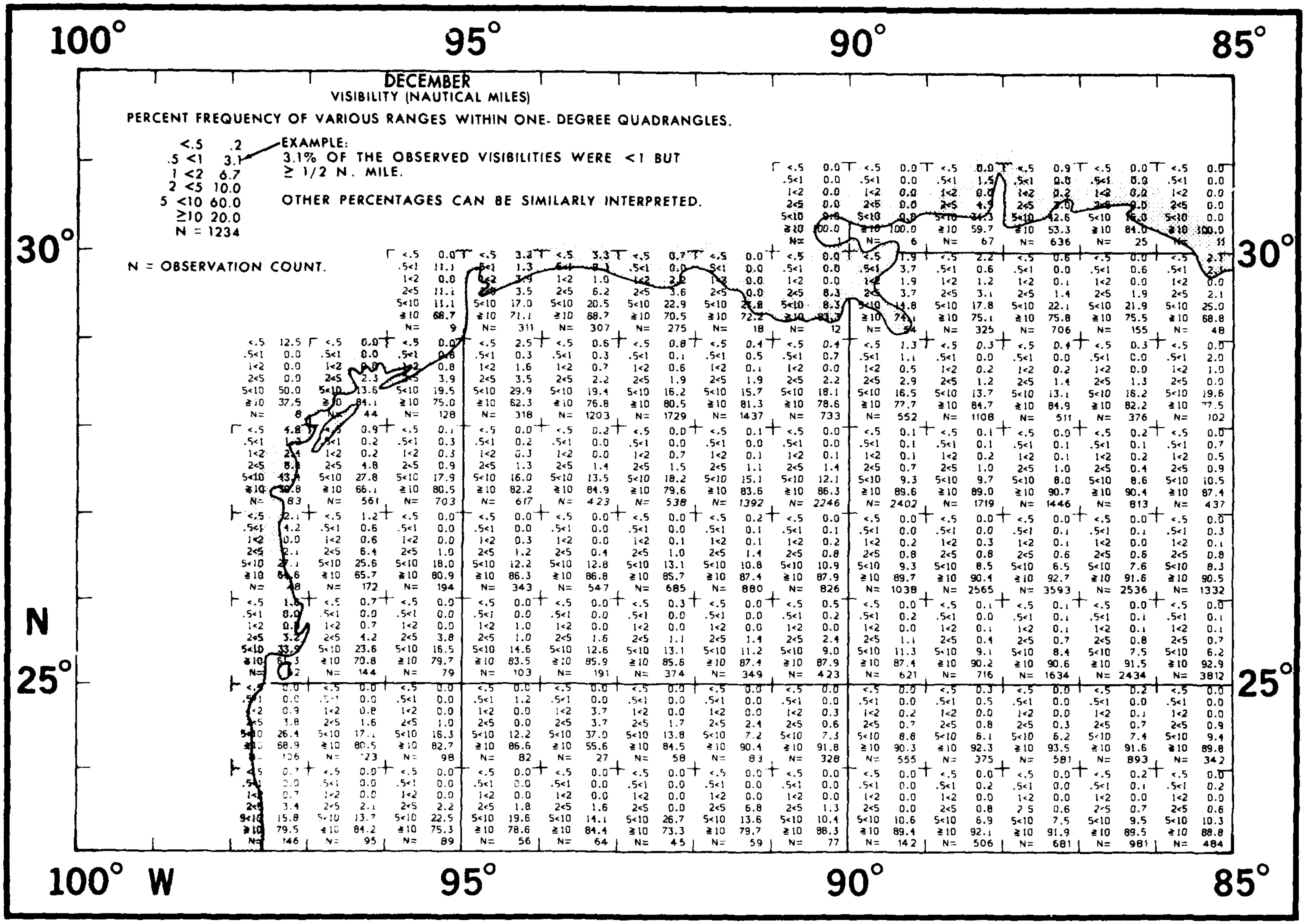

NOVEMBER
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
SOLID LINE - WAVE HEIGHT ≥3 FEET
DASHED LINE - WAVE HEIGHT ≥8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS.
SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
40
50
60
70
80
10
20
30

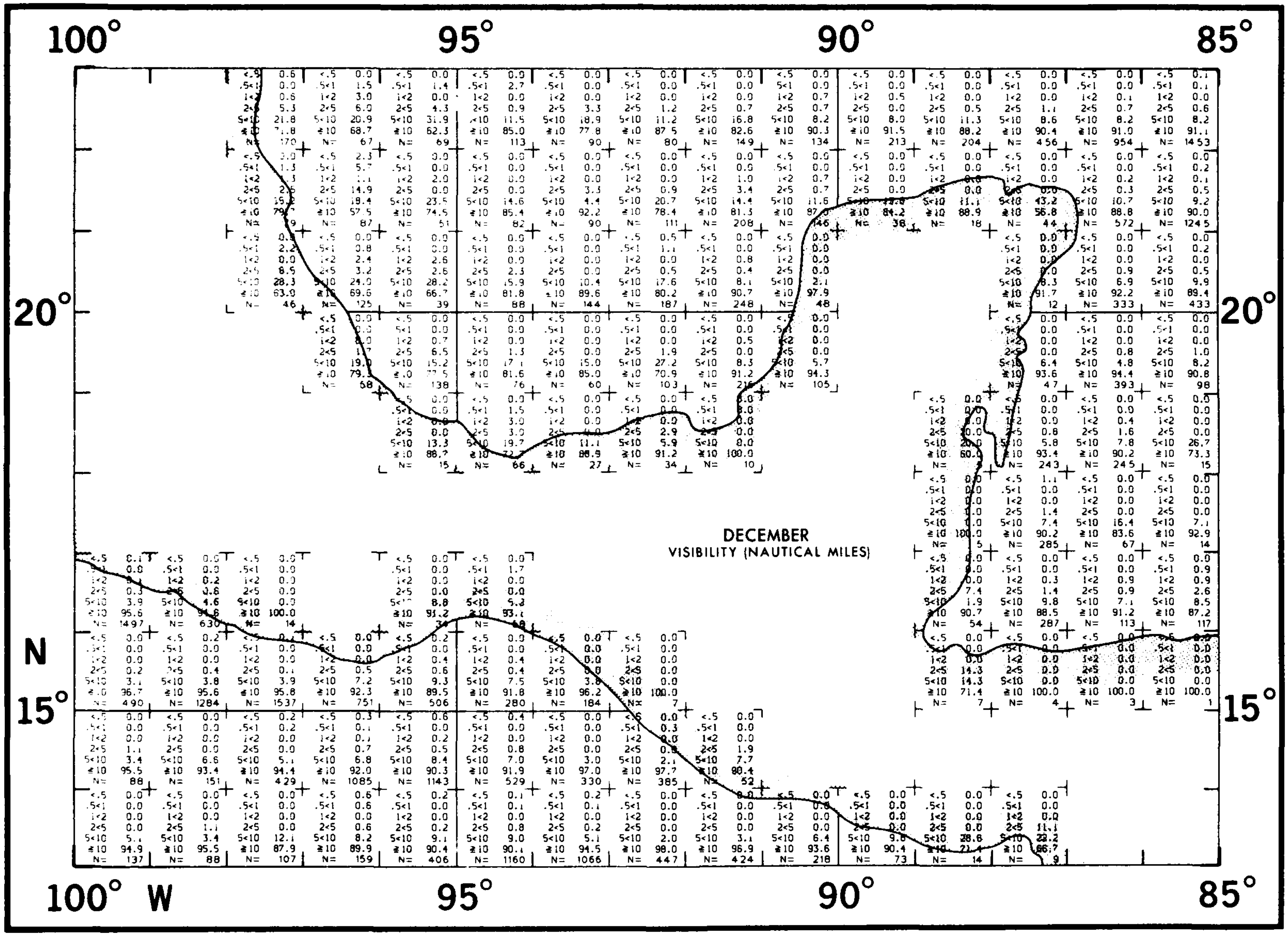

NOVEMBER
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
EXAMPLE:
30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
100°
90°
85°
30°
N
25°
100° W
95°
90°
85°

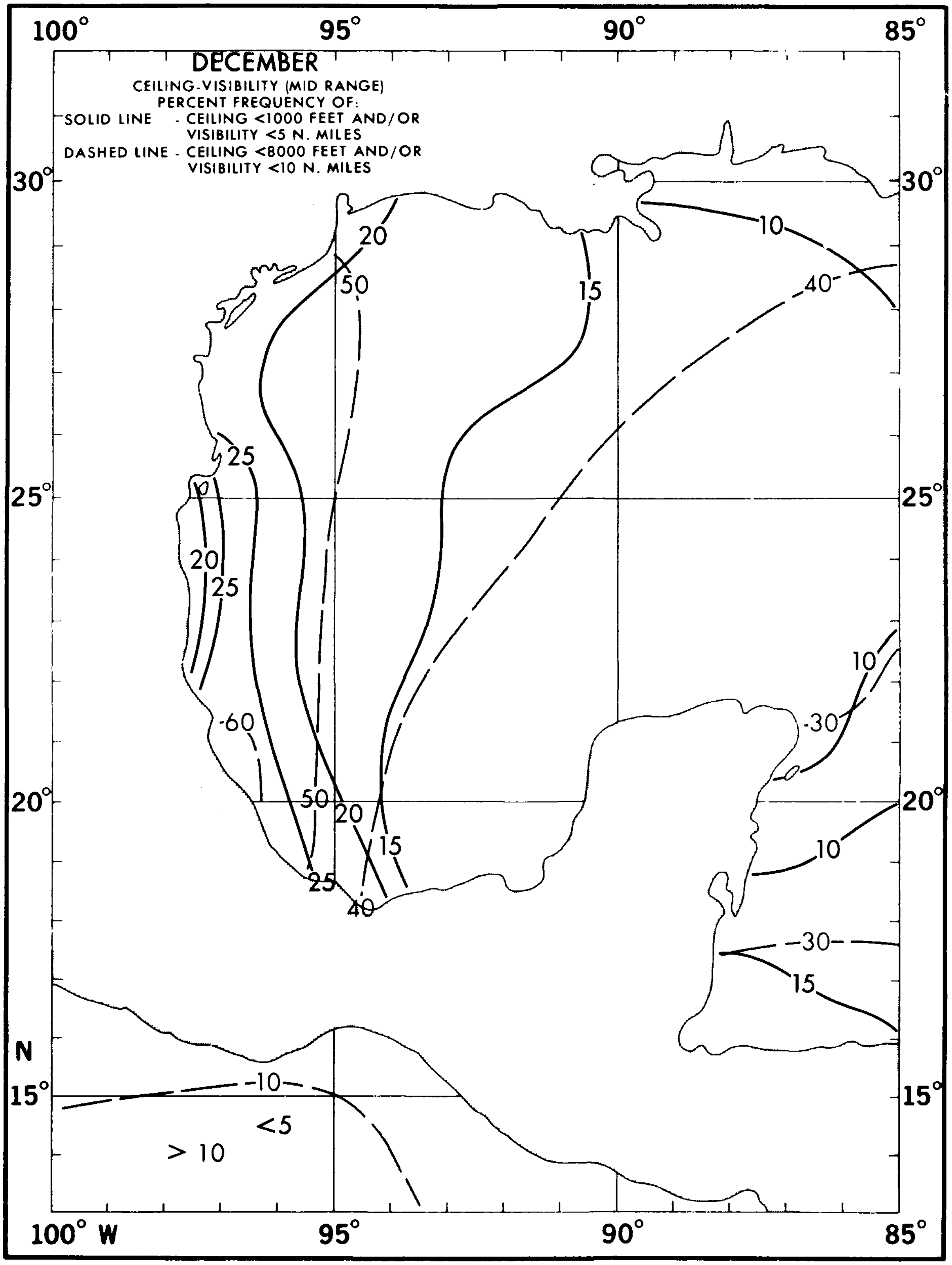

NOVEMBER
WAVE HEIGHT-FREQUENCIES
100°
95°
90°
85°
20°
15°
N
100° W

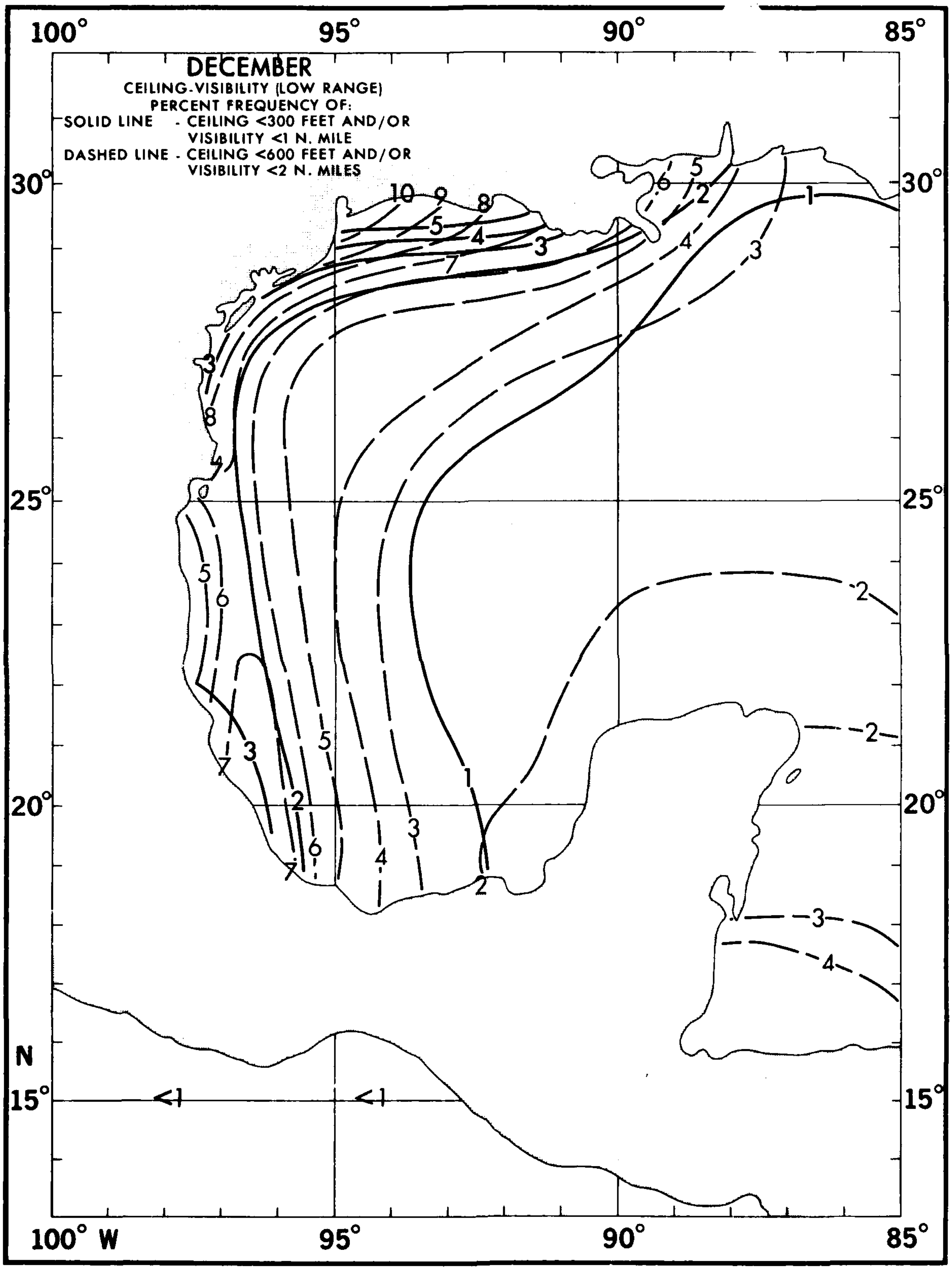

DECEMBER
CLOUD COVER
PERCENT FREQUENCY OF:
SOLID LINE - TOTAL CLOUD AMOUNT ≤2/8
DASHED LINE - LOW CLOUD AMOUNT ≥5/8
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
40
30
20
<10
60
70

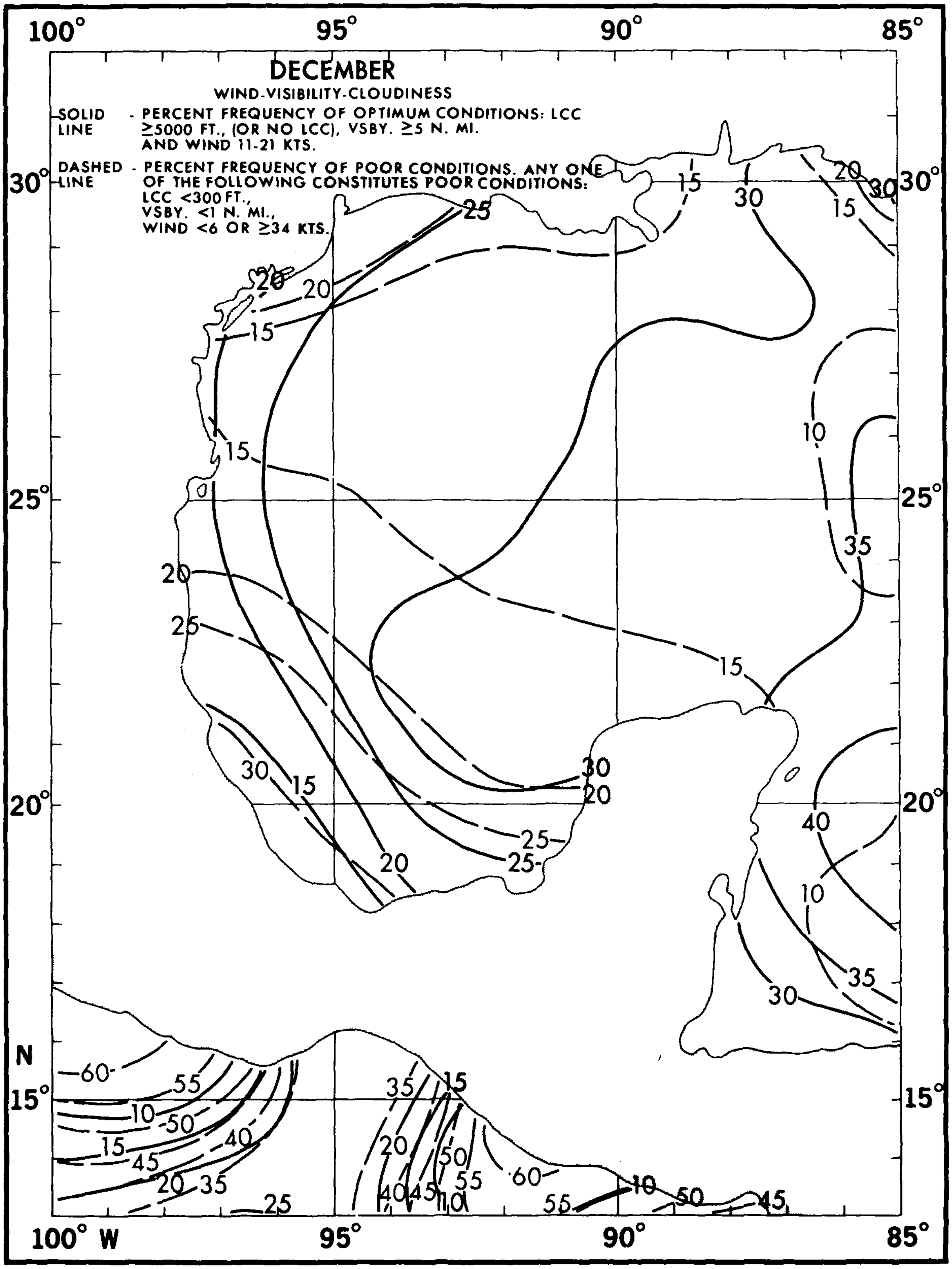

DECEMBER
PRECIPITATION
PERCENT FREQUENCY OF
OBSERVATIONS REPORTING PRECIPITATION
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
4
3
2
5
6
7
8
9
<1


DECEMBER
VISIBILITY (NAUTICAL MILES)
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE- DEGREE QUADRANGLES.
<.5 .2
.5 <1 3.1
1 <2 6.7
2 <5 10.0
5 <10 60.0
≥10 20.0
N = 1234
EXAMPLE:
3.1% OF THE OBSERVED VISIBILITIES WERE <1 BUT ≥ 1/2 N. MILE.
OTHER PERCENTAGES CAN BE SIMILARLY INTERPRETED.
N = OBSERVATION COUNT.
100°
95°
90°
85°
30°
25°
N
100° W

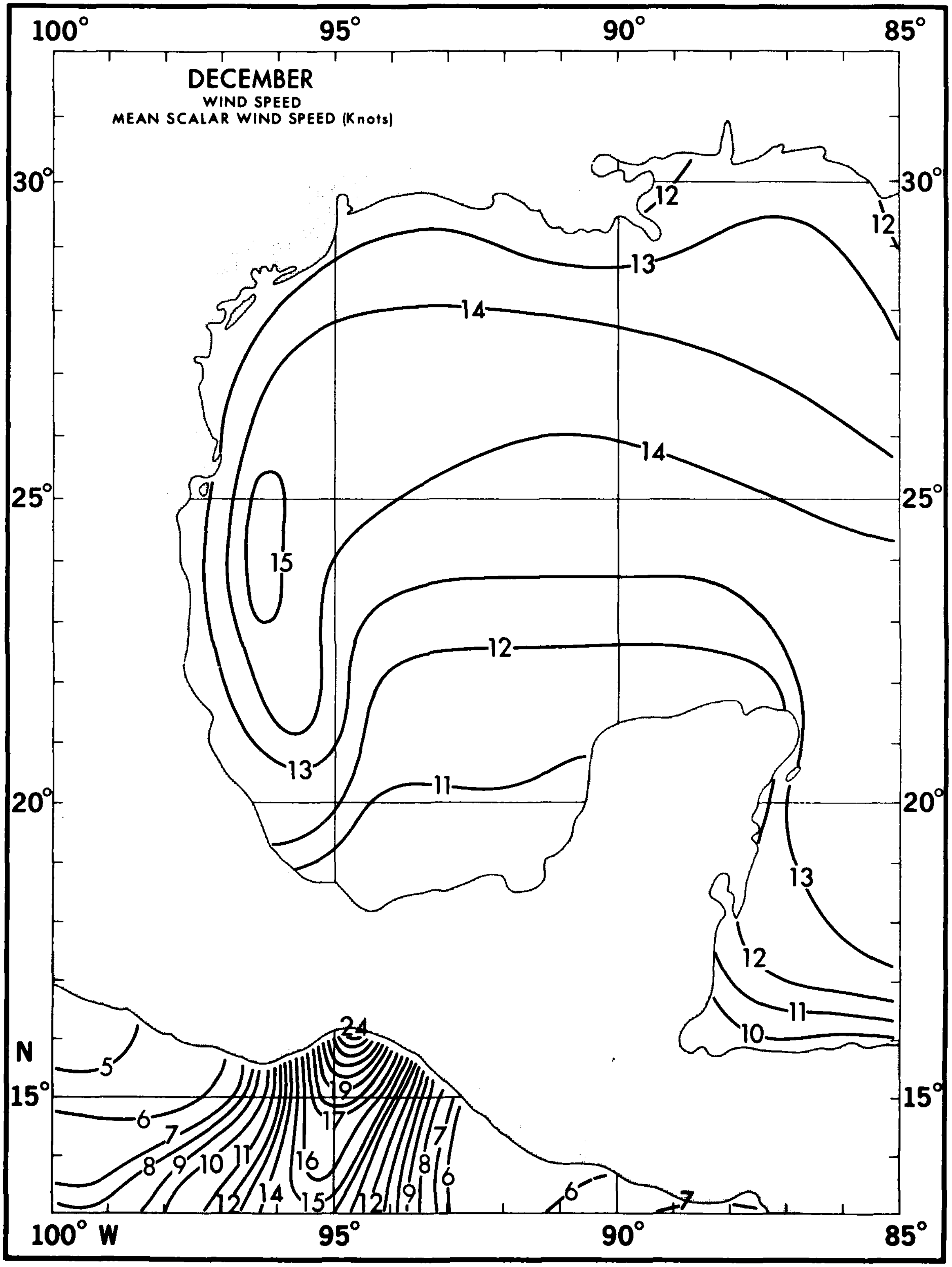

100°
95°
90°
85°
20°
15°
N
100° W
DECEMBER
VISIBILITY (NAUTICAL MILES)

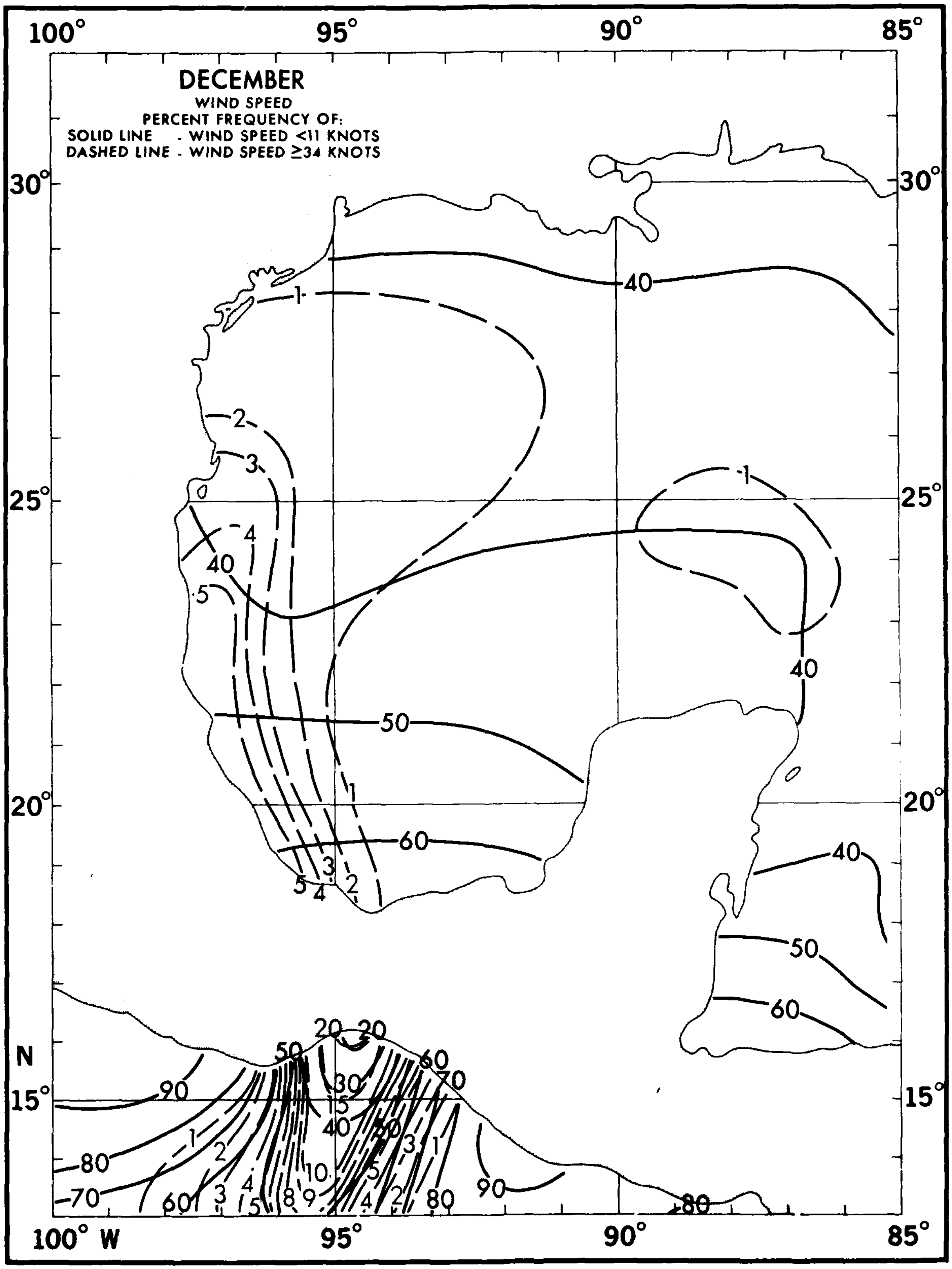

DECEMBER
CEILING-VISIBILITY (MID RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <1000 FEET AND/OR VISIBILITY <5 N. MILES
DASHED LINE - CEILING <8000 FEET AND/OR VISIBILITY <10 N. MILES
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
10
40
15
20
50
25
60
30
<5
> 10

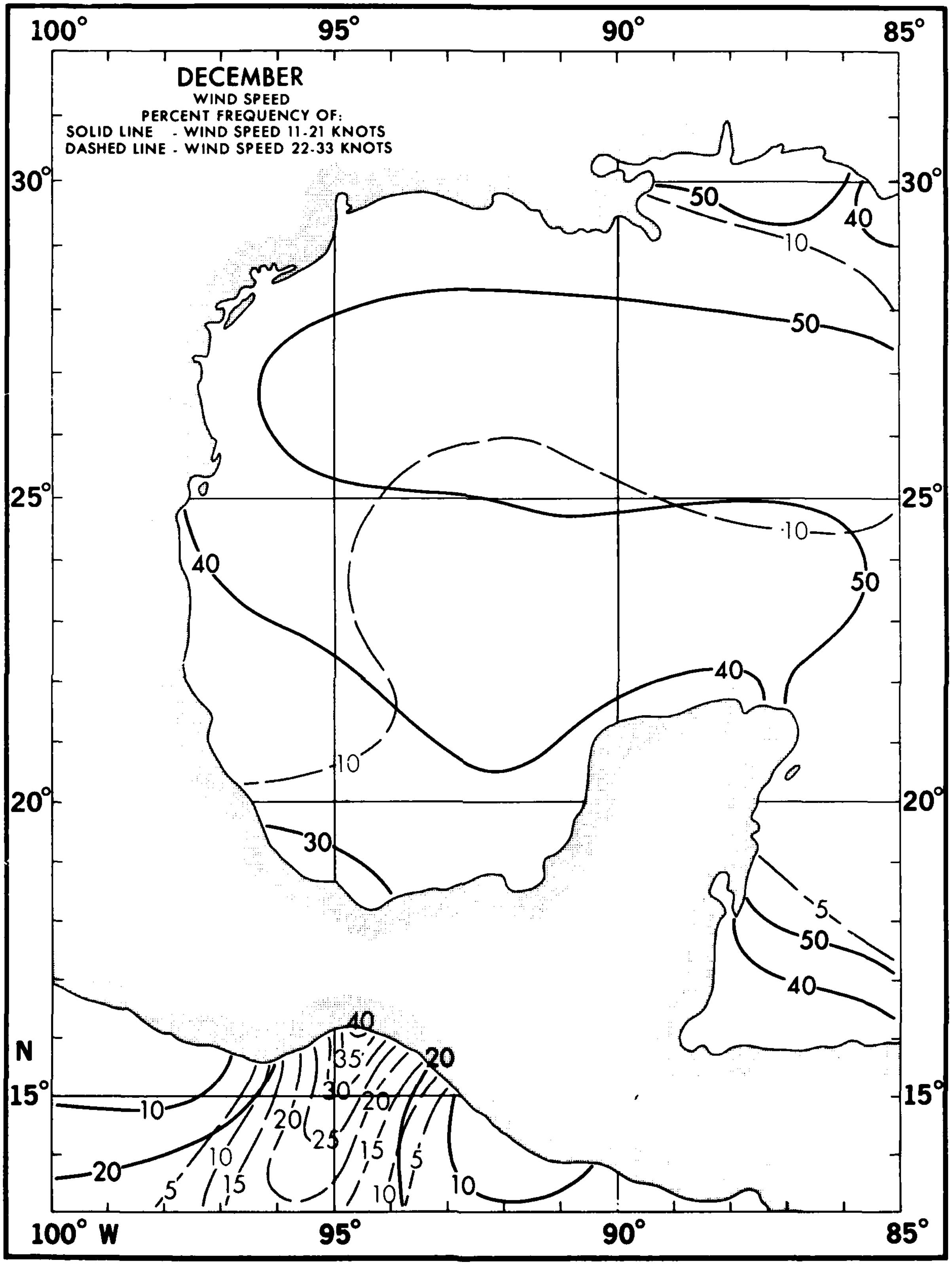

DECEMBER
CEILING-VISIBILITY (LOW RANGE)
PERCENT FREQUENCY OF:
SOLID LINE - CEILING <300 FEET AND/OR VISIBILITY <1 N. MILE
DASHED LINE - CEILING <600 FEET AND/OR VISIBILITY <2 N. MILES
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
<1
<1

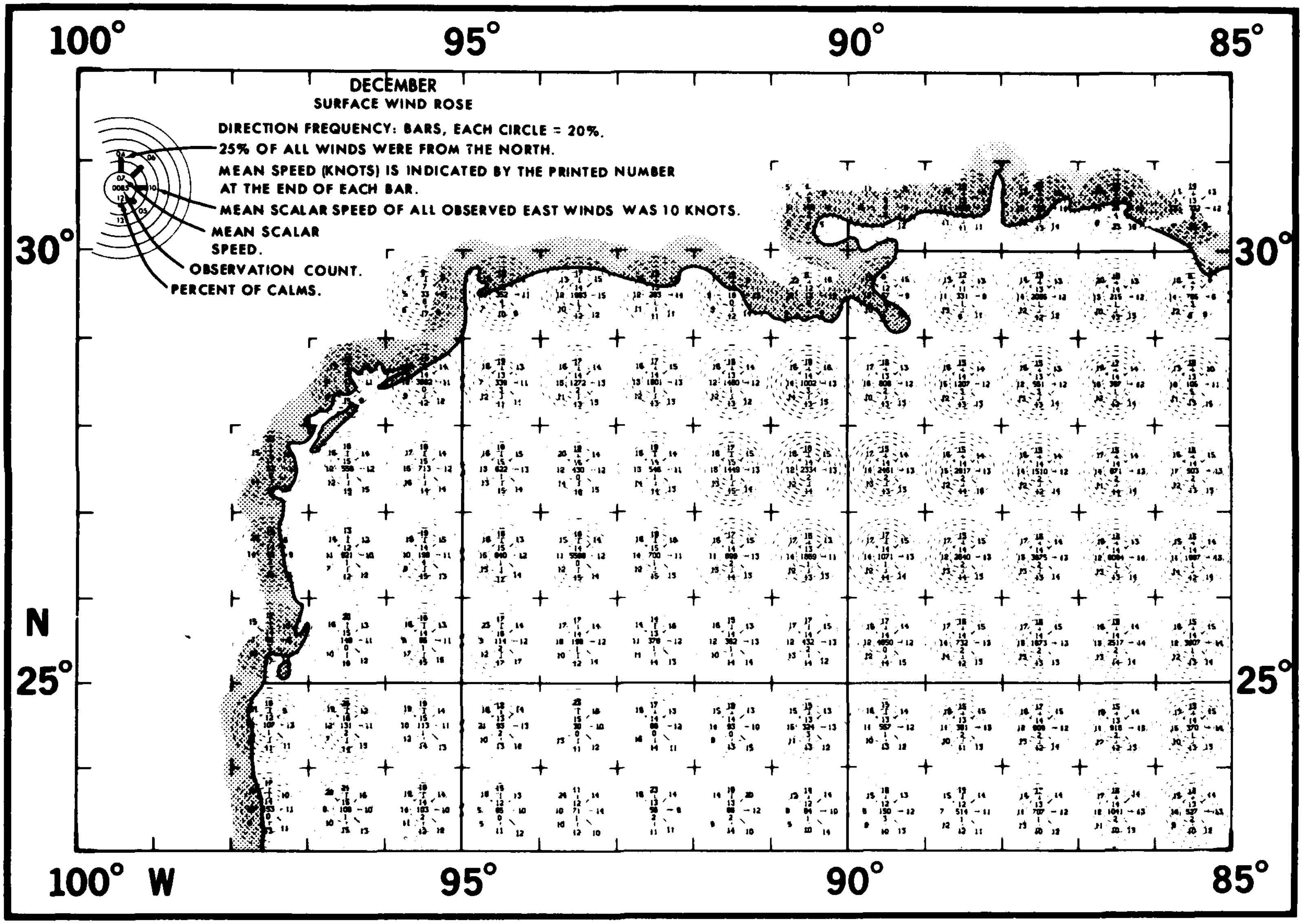


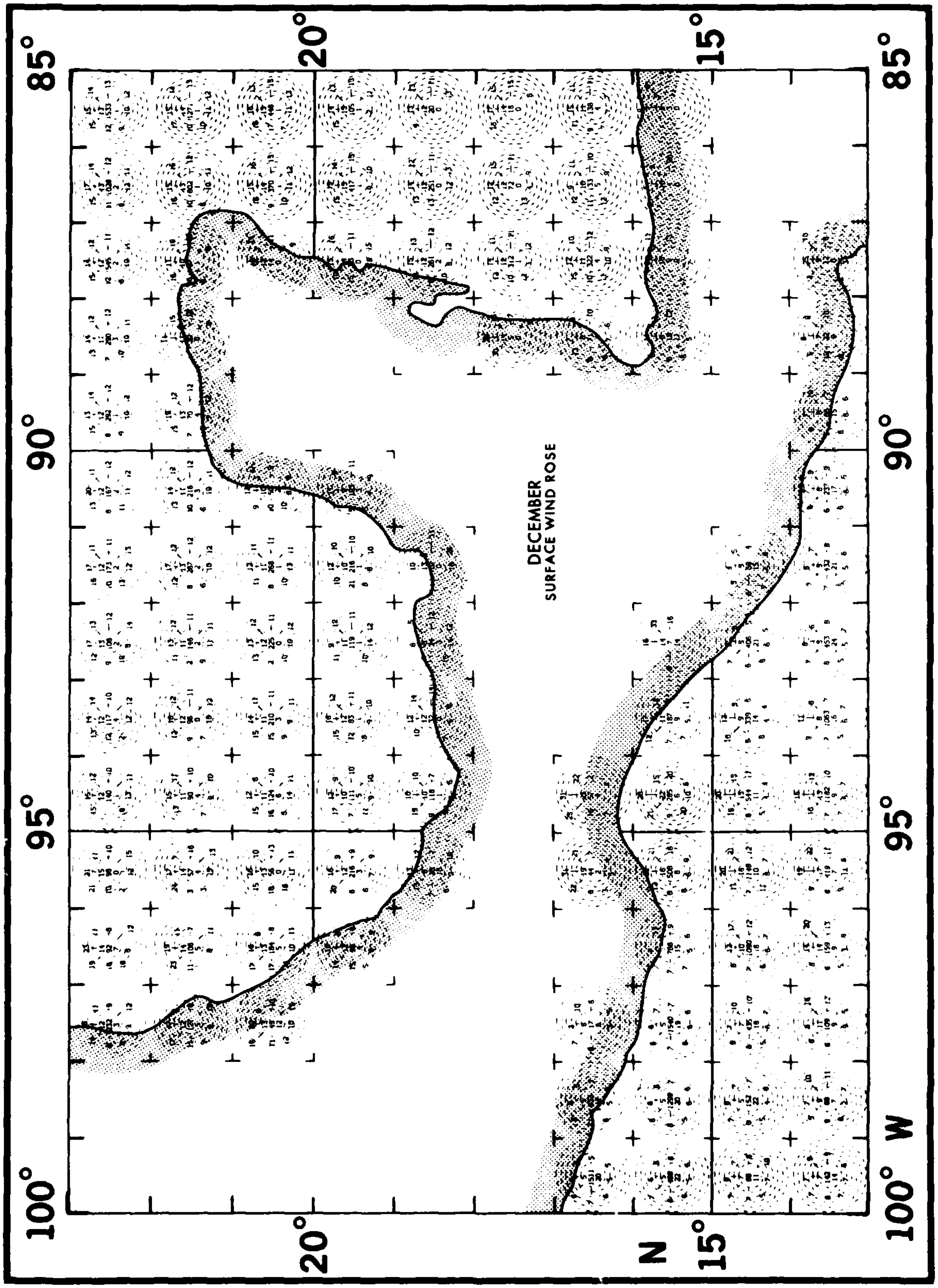
DECEMBER
WIND-VISIBILITY-CLOUDINESS
SOLID LINE - PERCENT FREQUENCY OF OPTIMUM CONDITIONS: LCC ≥5000 FT., (OR NO LCC), VSBY. ≥5 N. MI. AND WIND 11-21 KTS.
DASHED LINE - PERCENT FREQUENCY OF POOR CONDITIONS. ANY ONE OF THE FOLLOWING CONSTITUTES POOR CONDITIONS: LCC <300 FT., VSBY. <1 N. MI., WIND <6 OR ≥34 KTS.
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W

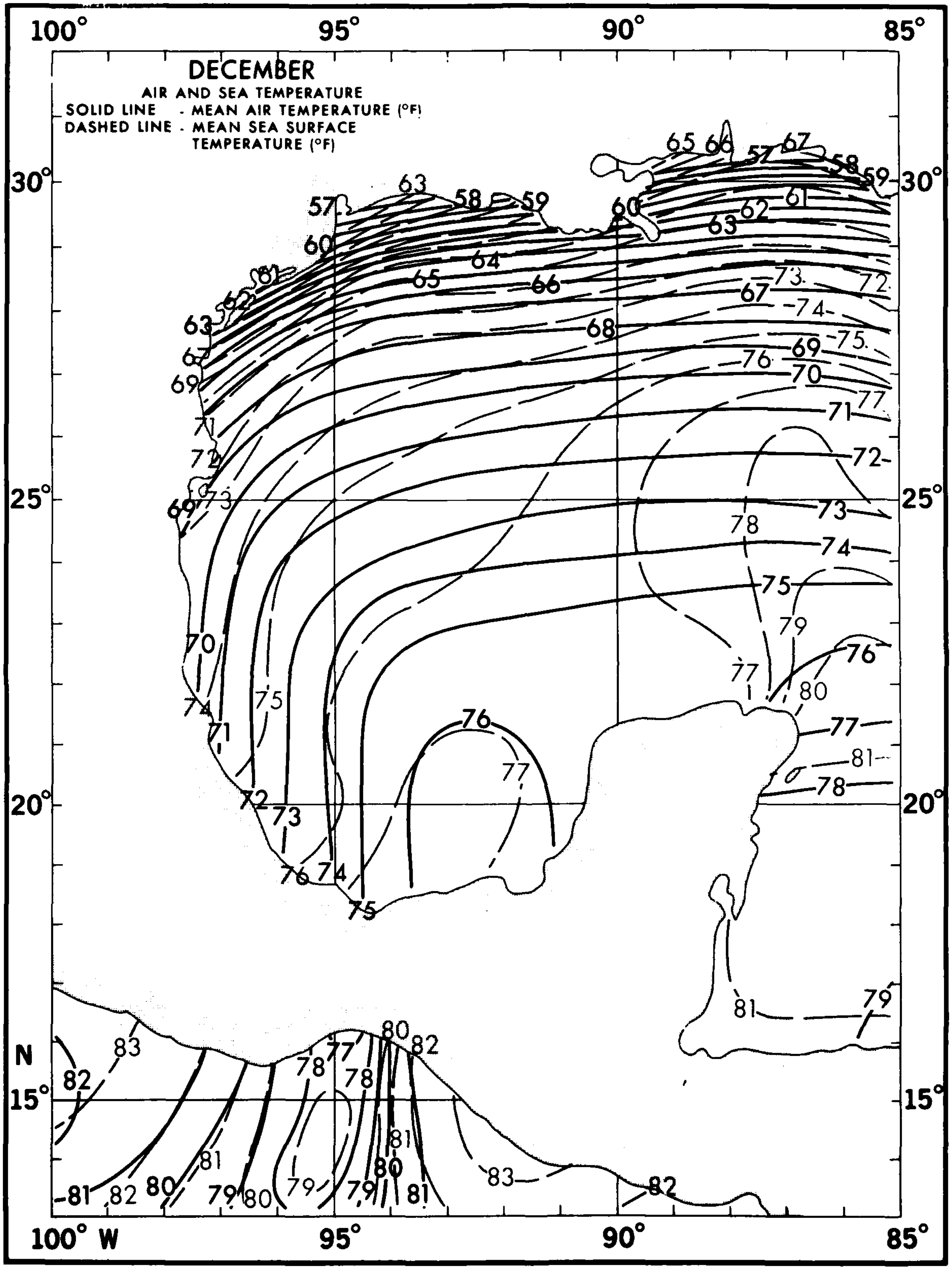

DECEMBER
WIND SPEED
MEAN SCALAR WIND SPEED (Knots)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
12
13
14
15
11
10
24
19
17
16
5
6
7
8
9

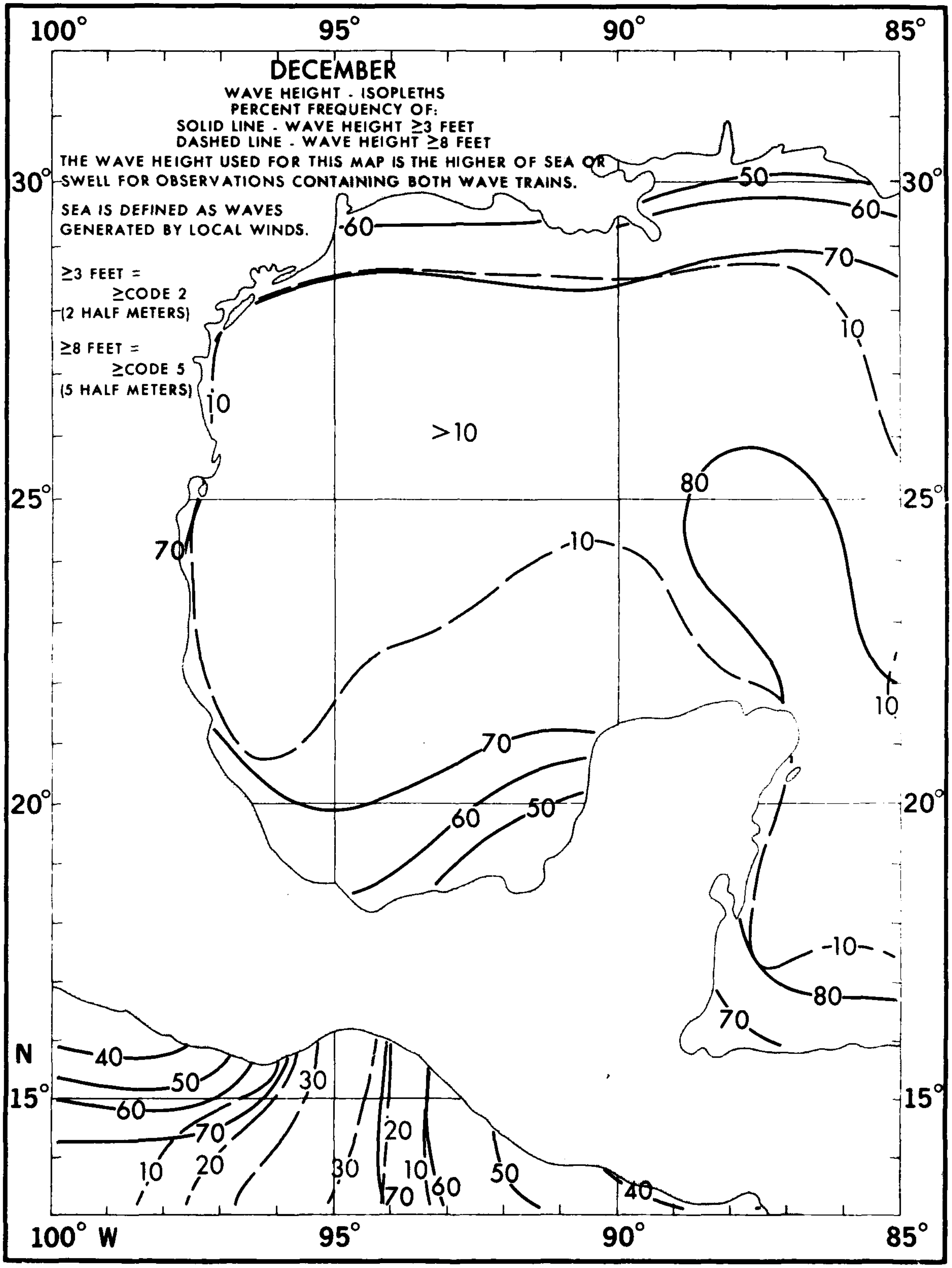

DECEMBER
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED <11 KNOTS
DASHED LINE - WIND SPEED ≥34 KNOTS
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W


DECEMBER
WIND SPEED
PERCENT FREQUENCY OF:
SOLID LINE - WIND SPEED 11-21 KNOTS
DASHED LINE - WIND SPEED 22-33 KNOTS
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W
50
40
10
30
5
20
35
25
15

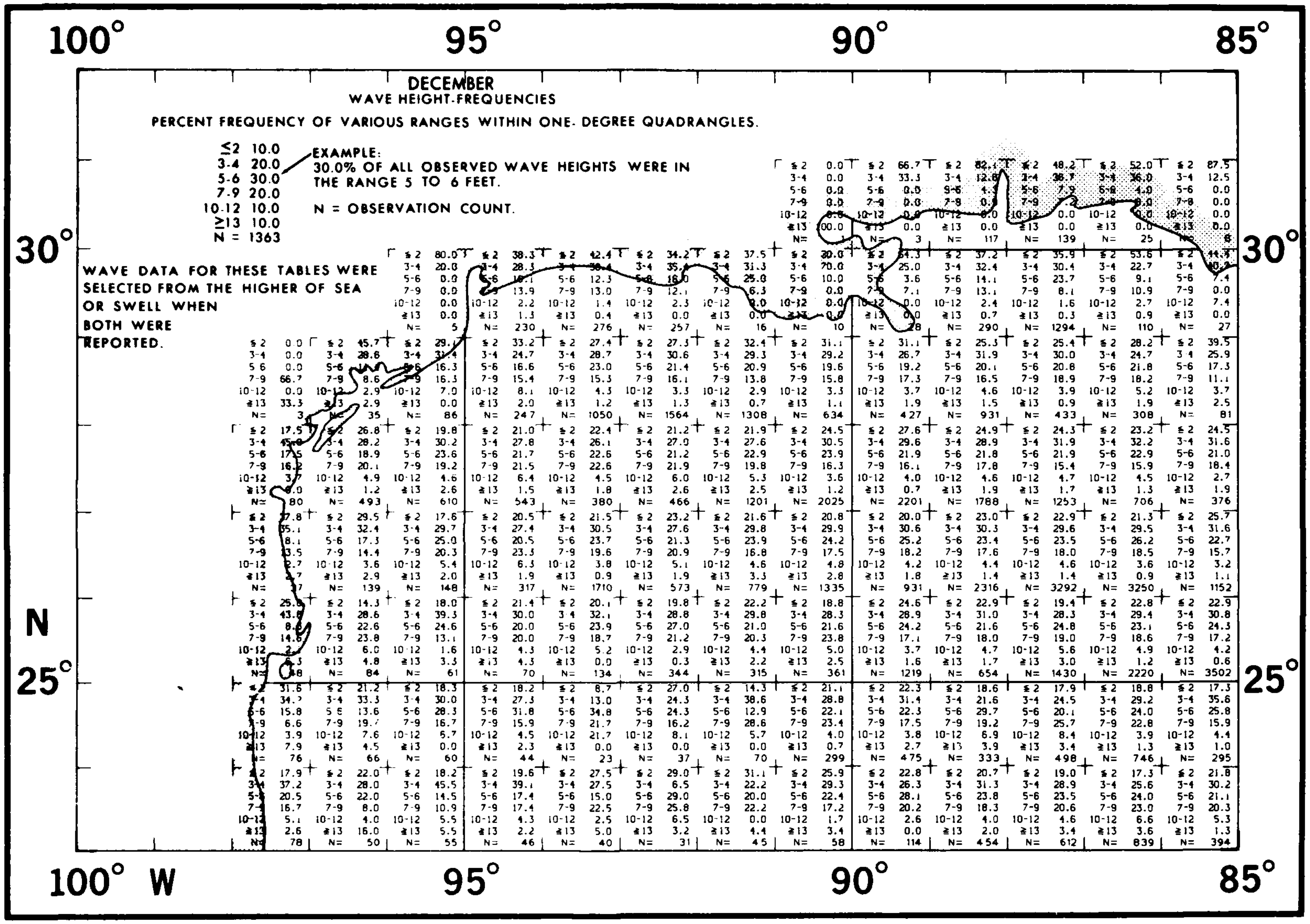

DECEMBER
SURFACE WIND ROSE
DIRECTION FREQUENCY: BARS, EACH CIRCLE = 20%.
25% OF ALL WINDS WERE FROM THE NORTH.
MEAN SPEED (KNOTS) IS INDICATED BY THE PRINTED NUMBER AT THE END OF EACH BAR.
MEAN SCALAR SPEED OF ALL OBSERVED EAST WINDS WAS 10 KNOTS.
MEAN SCALAR SPEED.
OBSERVATION COUNT.
PERCENT OF CALMS.
100°
95°
90°
85°
30°
25°
N
100° W

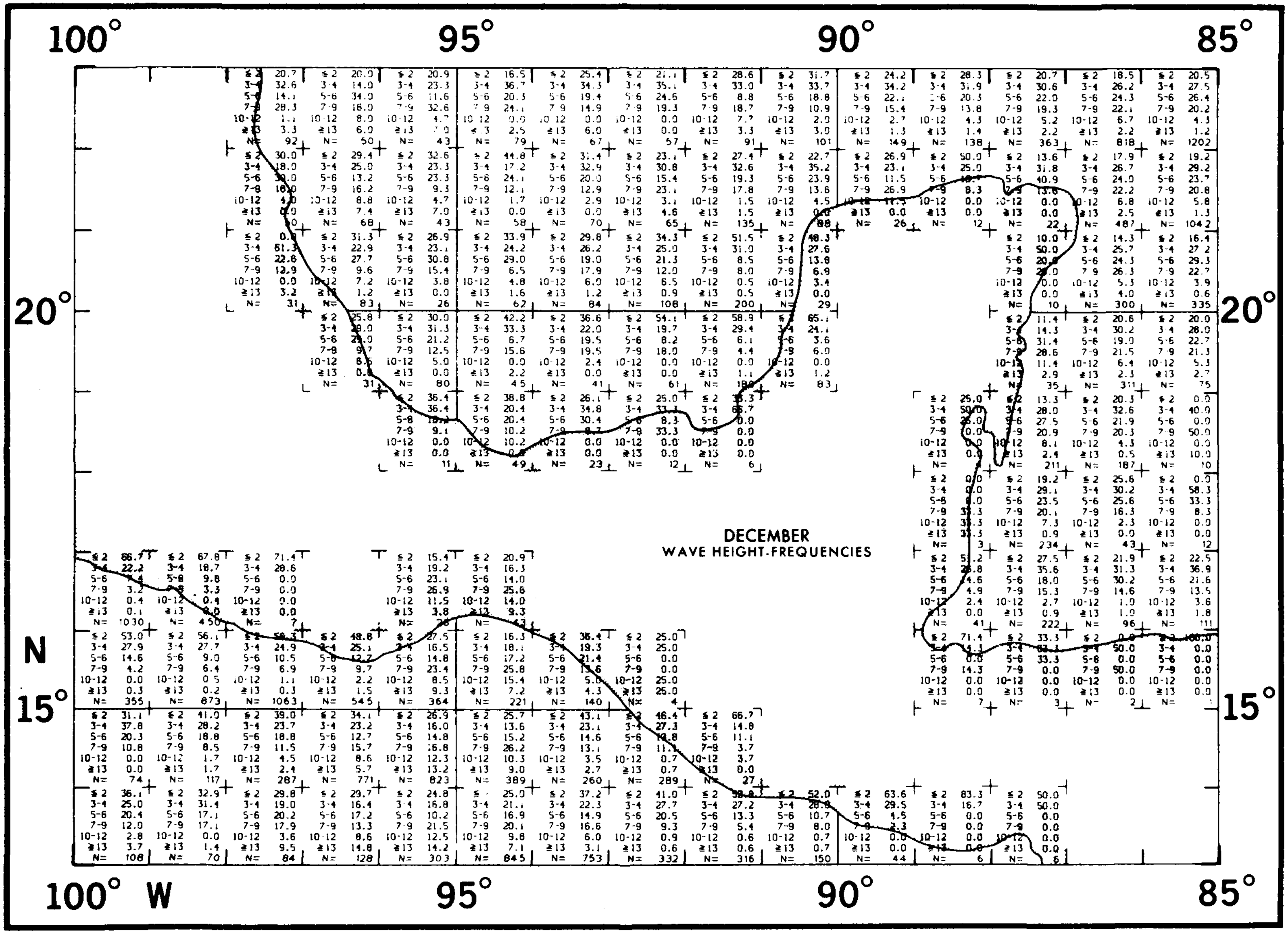

DECEMBER
SURFACE WIND ROSE
85°
90°
95°
100° W
20°
15°
N 15°


DECEMBER
AIR AND SEA TEMPERATURE
SOLID LINE - MEAN AIR TEMPERATURE (°F)
DASHED LINE - MEAN SEA SURFACE TEMPERATURE (°F)
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W



100°
95°
90°
85°
DECEMBER
WAVE HEIGHT - ISOPLETHS
PERCENT FREQUENCY OF:
SOLID LINE - WAVE HEIGHT ≥3 FEET
DASHED LINE - WAVE HEIGHT ≥8 FEET
THE WAVE HEIGHT USED FOR THIS MAP IS THE HIGHER OF SEA OR SWELL FOR OBSERVATIONS CONTAINING BOTH WAVE TRAINS.
SEA IS DEFINED AS WAVES GENERATED BY LOCAL WINDS.
≥3 FEET = ≥CODE 2 (2 HALF METERS)
≥8 FEET = ≥CODE 5 (5 HALF METERS)
30°
25°
20°
N
15°
>10
100° W

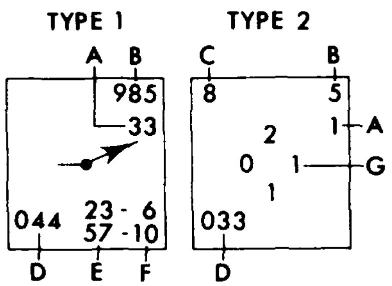

DECEMBER
WAVE HEIGHT-FREQUENCIES
PERCENT FREQUENCY OF VARIOUS RANGES WITHIN ONE-DEGREE QUADRANGLES.
≤2 10.0
3-4 20.0
5-6 30.0
7-9 20.0
10-12 10.0
≥13 10.0
N = 1363
EXAMPLE: 30.0% OF ALL OBSERVED WAVE HEIGHTS WERE IN THE RANGE 5 TO 6 FEET.
N = OBSERVATION COUNT.
WAVE DATA FOR THESE TABLES WERE SELECTED FROM THE HIGHER OF SEA OR SWELL WHEN BOTH WERE REPORTED.
100°
95°
90°
85°
30°
25°
N
100° W


100°
95°
90°
85°
20°
N
15°
100° W
DECEMBER
WAVE HEIGHT-FREQUENCIES

SURFACE CURRENTS

Data Presentation

The following legend shows two types of surface current presentations by 1° quadrangle, type 1 with 12 or more observations and type 2 with fewer than 12 observations. Where there are 11 or fewer observations within a 1° quadrangle, the total number of observations is shown within the 90° quadrant containing the observations.



A Number of calms (included in total observations).

B Total observations

C Mean speed (0.8 knot) for all observations.

D Vector resultant direction (°T) for all observations.

E Percent frequencies (57% primary direction, 23% secondary direction).

F Mean speeds (1.0 knot primary direction, 0.6 knot secondary direction).

G Number of observations by quadrant.

Type 1 - If there are 12 or more non-calm observations in a 1° quadrangle, the surface current is depicted by vector resultants as follows:

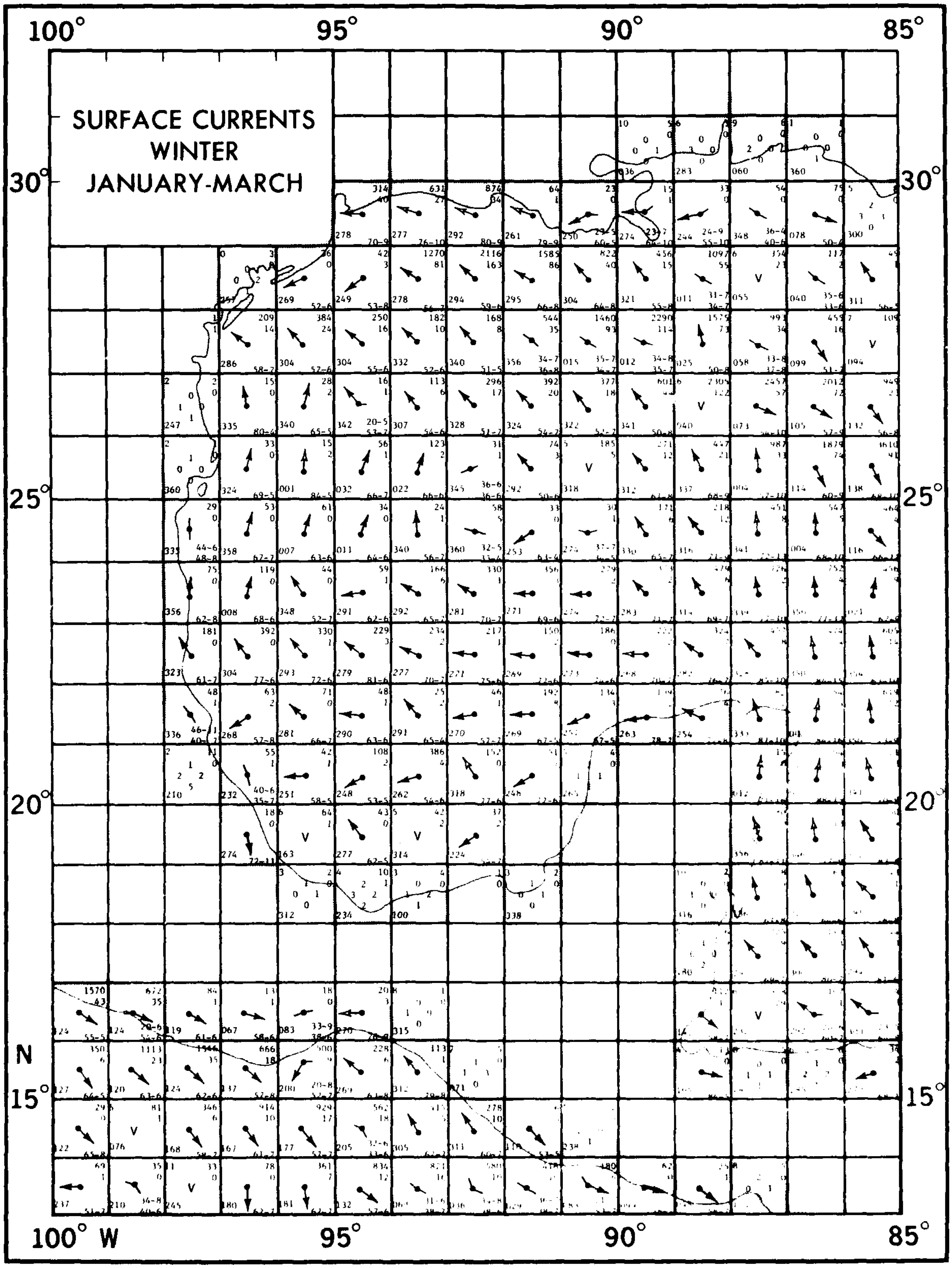
Persistent Current - 60 percent or more of all observations fall within a 45° sector of the 8-point compass.

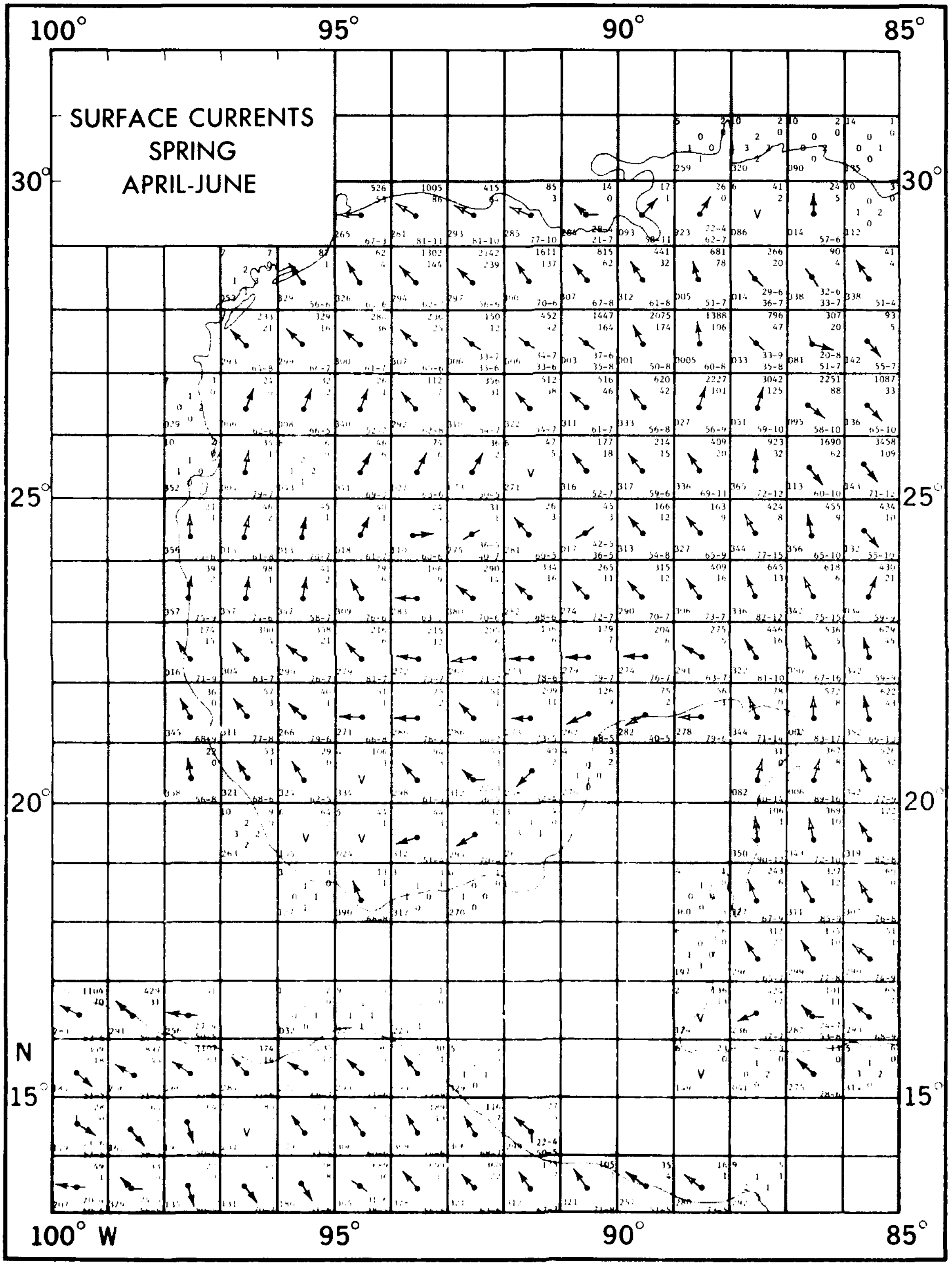
Primary Current with Secondary Direction - Primary Current - 50 percent or more of all observations fall within three adjacent 45° sectors. Secondary Direction - 20 percent or more of all observations fall within a 45° sector, and the two resultant vector directions are separated by more than 90° of arc.

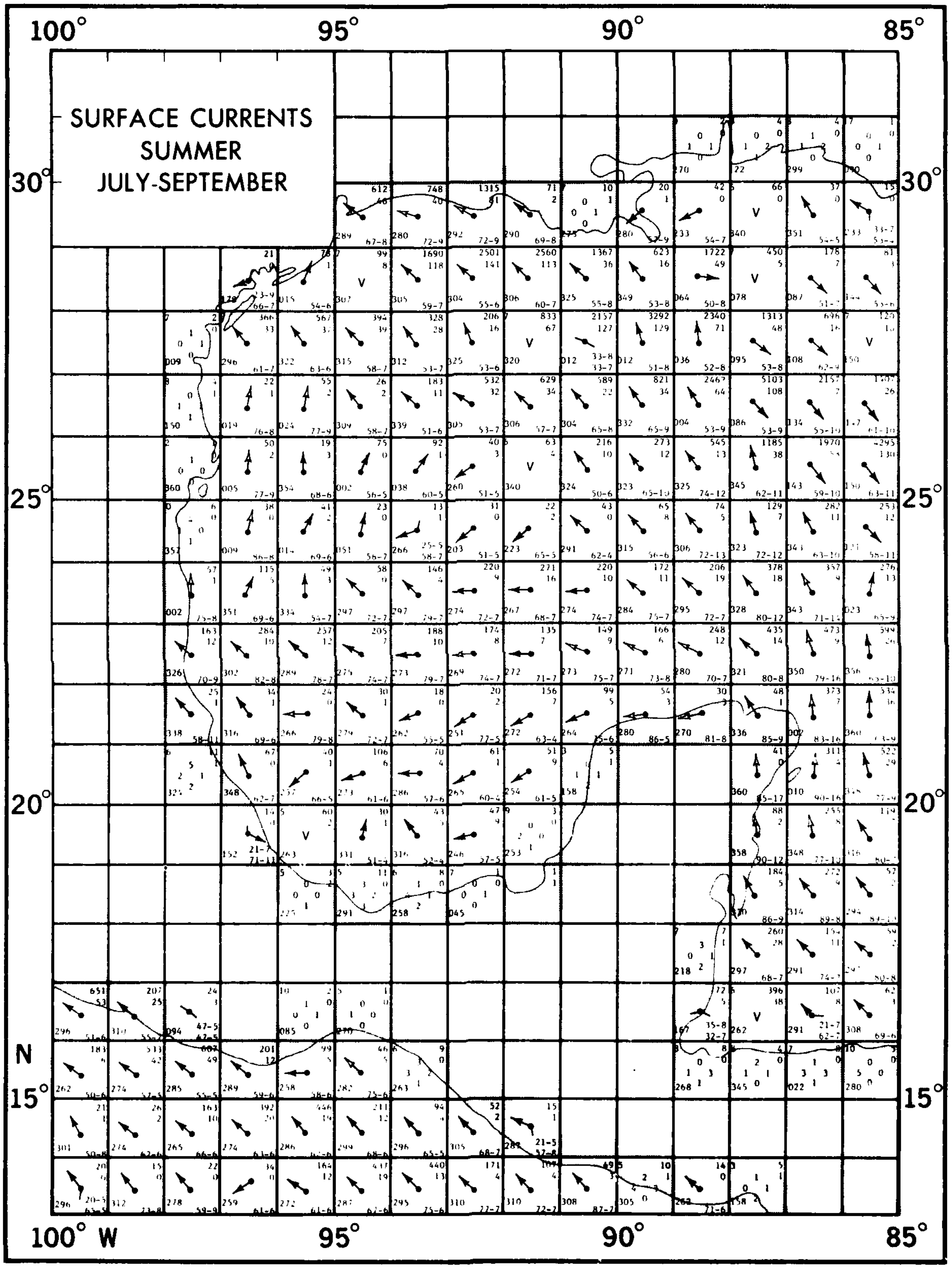
Prevailing Current - 70 percent or more of all observations fall within two adjacent 45° sectors.

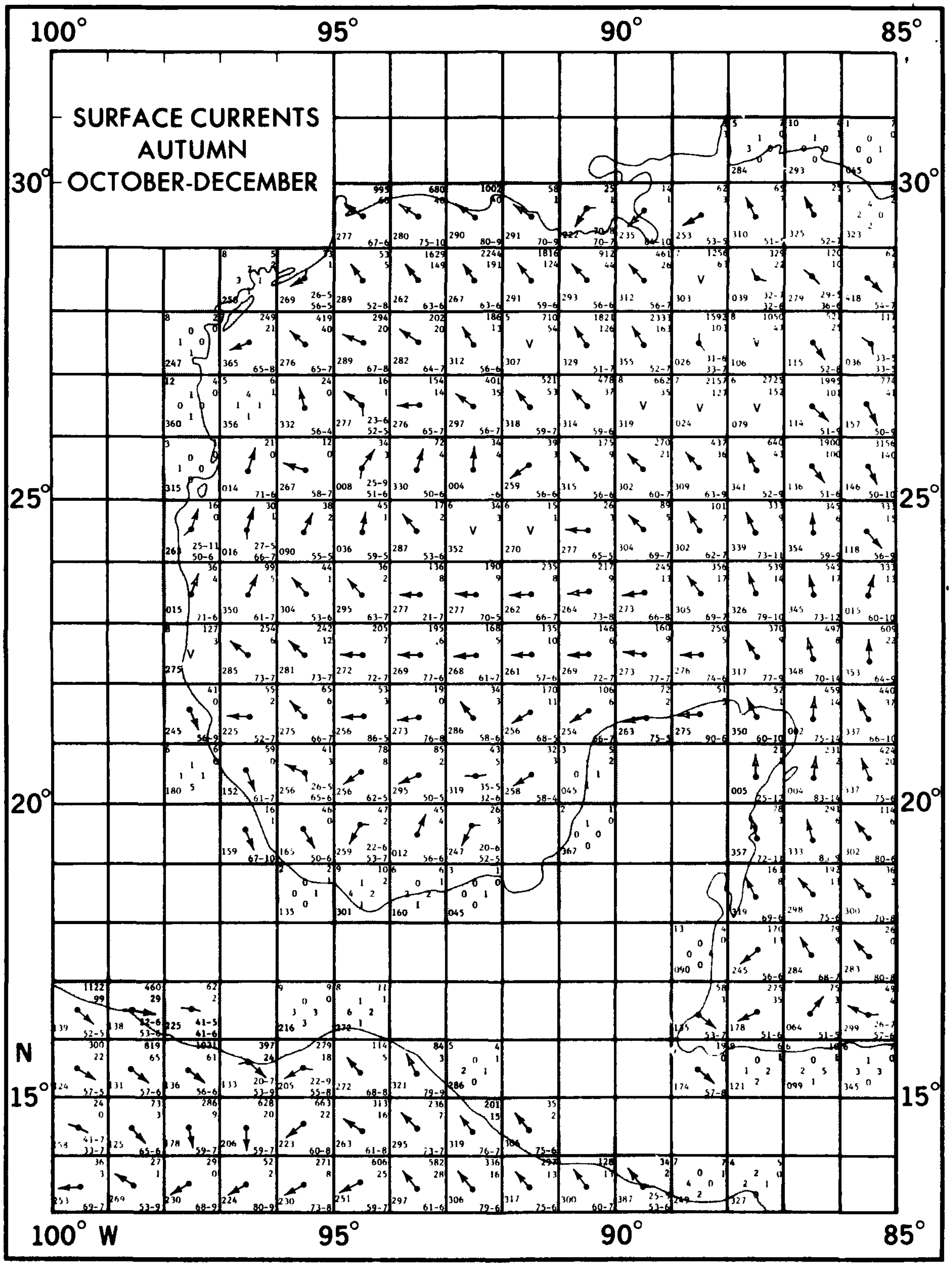
Bizonal Flow - Practically all observations are concentrated in opposite pairs of 45° sectors, and one pair contains at least 80 percent as many observations as the opposite pair. This generally indicates variability that occurs in zones of entrainment between opposing currents.

V Variable Current - The 45° sector with most observations has less than 25 percent of all observations; direction is indeterminate.


SURFACE CURRENTS
WINTER
JANUARY-MARCH
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W


SURFACE CURRENTS
SPRING
APRIL-JUNE
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W


SURFACE CURRENTS
SUMMER
JULY-SEPTEMBER
100°
95°
90°
85°
30°
25°
20°
N
15°
100° W


SURFACE CURRENTS
AUTUMN
OCTOBER-DECEMBER
100°
95°
90°
85°
30°
25°
20°
15°
N
100° W

END

DATE

FILMED

2-87